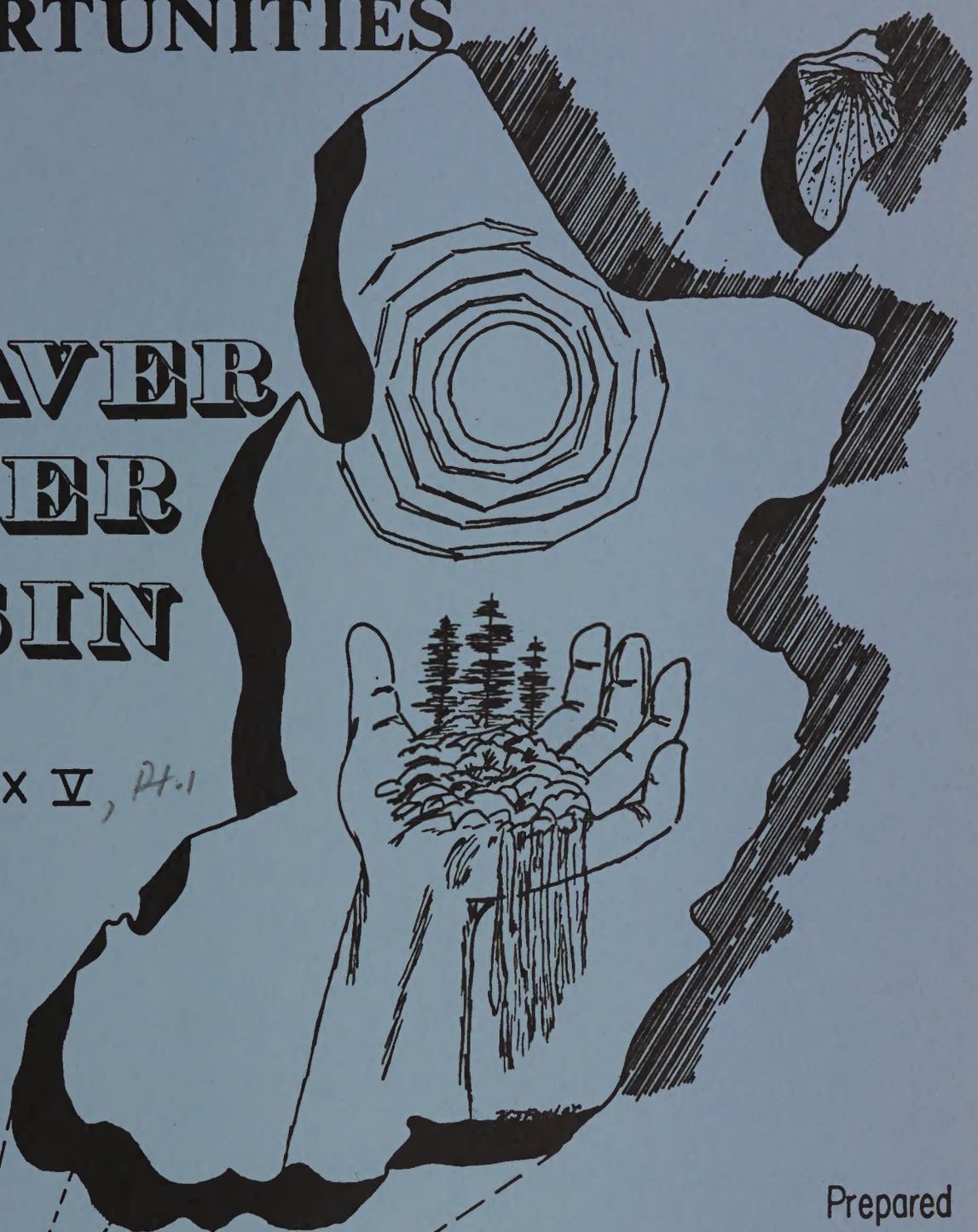
POTENTIAL DEVELOPMENT OPPORTUNITIES

BEAVER RIVER BASIN



APPENDIX V, Pt.1

JUNE 1973

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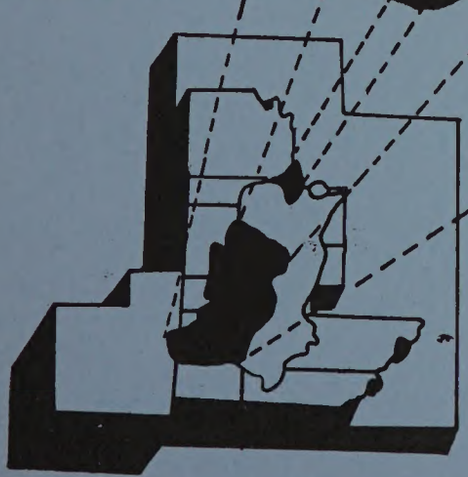

Prepared By
UNITED STATES
DEPARTMENT of AGRICULTURE
Economic Research Service – Forest Service
Soil Conservation Service
In cooperation with
UTAH STATE
DEPARTMENT of NATURAL RESOURCES
and UNITED STATES DEPARTMENT of INTERIOR
Bureau of Land Management

APPENDIX V

POTENTIAL DEVELOPMENT OPPORTUNITIES

BEAVER RIVER BASIN

UTAH - NEVADA

Prepared by
United States Department of Agriculture
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June 1973

The following publications have been prepared under the Beaver River Basin study:

Summary Report

Appendix I	Natural Resource Inventory Soils Supplement
Appendix II	Present and Projected Resource Use and Management Water Related Land Use Supplement Water Budget Analysis Supplement
Appendix III	Resource Related Problems
Appendix IV	Economic Base and Needs
Appendix V	Potential Development Opportunities Irrigation Systems Supplement

APPENDIX V

POTENTIAL DEVELOPMENT OPPORTUNITIES

CONTENTS

TABLES

TABLES (continued)

MAPS

APPENDIX V

POTENTIAL DEVELOPMENT OPPORTUNITIES

I N T R O D U C T I O N

This appendix identifies (1), the physical potential for development in connection with resource needs and problems and (2), the opportunities for development that are within programs authorized for the U. S. Department of Agriculture and the U. S. Department of Interior, Bureau of Land Management. Identification of potentials and opportunities in this report does not imply either that they are the only developments or that they will be supported by the public, state and federal agencies for development. Their identification is based upon reconnaissance level investigations and more detailed analysis as to their economic and physical feasibility as well as environmental impact will be needed prior to implementation.

Existing developments and those developments expected to be achieved from the continuation of on-going programs, (going programs) and the acceleration of on-going programs, (accelerated programs) are identified for the next 10 to 15 year period. Potentials beyond this period are projected. Effects of developments on resource conservation and use, the economy, and the environment are described.

Local people, land managers, and planners identified alternative means for improving the use and management of water and related land resources. Resource benefits are identified in quantifiable terms such as AUM's of increased grazing, acre feet of water salvaged, acre feet of reduced sedimentation, etc. Alternatives to maximize benefits within existing standards and physical constraints were identified. Environmental impacts of alternatives are described for the following components: a) ecological aspects of the relationship between living organisms and their environment, b) pollution of water, air and land, and c) esthetics.

This appendix is one of five prepared as part of the Beaver River Basin study. Appendix I, Natural Resource Inventory and Appendix II, Present and Projected Land Use and Management describe the Basin's basic resources and present and projected uses. Appendix I has a Soils Supplement, Appendix II has two supplements, Water Budget Analysis and Water-Related Land Use Inventory. These supplements enlarge on data in the Appendixes. The remaining appendixes are Appendix III, Resource Related Problems; Appendix IV, Economic Base and Needs. The Summary Report presents a resume of data appearing in these appendixes.

Chapter II

WATER RESOURCE DEVELOPMENT

There are several alternatives for water resource developments that would increase consumptive use or decrease consumptive use deficits. Water resource developments and results discussed in this chapter are: on-farm and off-farm irrigation improvements, and reservoir developments. Additional discussion of these alternatives is given in Appendix IV.

The average annual actual consumptive use on areas designated as irrigated cropland in the water budget analysis is 190,040 acre-feet. The potential consumptive use averages 252,510 acre-feet annually which results in an average annual consumptive use deficit of 62,470 acre-feet. Additional information in given in Appendix II and III.

Water resource developments will result in crop production increases on irrigated cropland. Requirements for livestock feed produced primarily on irrigated croplands are projected to increase by 1980 as follows: hay and pasture, 20,100 tons; feed grain, 696,550 bushel; and corn silage, 19,870 tons. Sufficient development potential is not available within the Basin to meet all of these livestock feed demands. Projections indicate there will be a surplus of hay, but deficits will occur for corn silage and feed grains. Further changes in cropping patterns may be necessary to balance livestock feed supply and demand. Additional discussion on present and projected agricultural production is given in Appendix IV.

The results of water resource developments will be an increase in use that will generally result in a decrease of recharge to the ground-water reservoirs. In most areas, the decrease in ground-water recharge will aggravate the already declining water table. It is pointed out in Appendix III that ground-water levels declined an average of 10 to 50 feet during the 1956-1965 study period. The largest declines were in the Escalante Desert and Fillmore subbasins. Beaver Valley was the only area not showing an average decrease in ground-water storage in this period.

Water resource developments effect lands irrigated both from wells and surface supplies. In several areas, ground-water is pumped to supplement surface supplies during periods when surface flows are low. In these areas, increased application efficiencies would permit users to pump less water even though the depth of pumping may be greater, thus resulting in little or no increase in costs. In areas served entirely from wells, pumping cost increases would be greater.

Data were not available to analyze and evaluate the effect adequately and careful consideration should be given to this aspect of water resource developments prior to installation. Additional interdisciplinary and interagency studies of the surface and ground water relationships are needed. Further discussion of ground-water pumping is given in Appendix IV.

ON-FARM AND OFF-FARM IRRIGATION IMPROVEMENTS

The effect on consumptive use deficits resulting from changes in irrigation efficiency were evaluated using an Automatic Data Processing (ADP) program. The "Irrigation" ADP program analysis used in this chapter of Appendix V should not be confused or interchanged with the "water budget" ADP program analysis used in the Water Budget Analysis Supplement to Appendix II. The values for consumptive use deficits calculated with the "irrigation" program and with the "water budget" program are slightly different. This is due to different basic assumptions used in the two programs, but is primarily due to the method of determining effective precipitation.

The "water budget" program is a water balance study made to simulate what actually happened during past years. This approach was used to evaluate the accuracy of all input data. The water budget or balance equation is: Supply minus consumptive use, equals outflow plus or minus changes in ground-water storage. A separate budget was prepared for each year of the study to show annual fluctuations of budget items. Further information and discussion is given in Appendix II, Water Budget Analysis Supplement.

The "irrigation" program distributes available water to satisfy cropland consumptive use needs. Evaluations of going and accelerated programs were made using a ten-year period (1956-1965). Base period efficiencies were used as a base for evaluating changes. Changes in consumptive use deficits for on-farm land treatment and off-farm conveyance system improvements (canal lining and pipelines) were evaluated and the effect determined.

Sound conservation planning dictates that on-farm and off-farm improvements be applied conjunctively. Therefore, only the combined net effects of applying both on-farm land treatment and off-farm conveyance system improvements are presented here. However, for analysis, land treatment and canal lining were analyzed separately and together. In some cases, a complementary condition prevailed, however, more often the two were competitive in that the first increment netted more benefits than the second. To prevent double counting of benefits, adjustments were made for canal lining and land treatment so that the separable benefits were not more than with both applied.

The analysis of land treatment and conveyance system improvements followed the concepts of identifying future conditions with and without the project. Some water shortages were noted in all watersheds analyzed. Most of the benefits attributed to improvements were connected with a reduction in root-zone water deficits. The "yardstick" consisted of efficiency changes and increased crop production resulting from the increase in available water.

A crop priority system was used for analysis which generally followed: (1) potatoes, (2) sugar beets, (3) small grain nurse crop, (4) small grain, (5) corn silage, (6) city lots, (7) alfalfa, and (8) pasture. Since alfalfa was nearly always the largest crop acreage and lowest priority, water shortages generally occurred on this crop. As a result, alfalfa yields were significantly less than potential. The total alfalfa acreage was divided by years in production so that greater accuracy of analysis would be realized. In the Escalante Desert subbasin, potato acreage ranged from 20 to 35 percent of the total irrigated area and in some years water shortages occurred on this crop as well as alfalfa. As a means of comparison between water supply and crop needs both were synthesized for an eight year period. Since this potato crop acreage was minor compared to the Basin, only alfalfa production changes attributed to improvement measures are shown.

Crop budgets were developed for the major crops grown within each of the subbasins for present conditions (1965), projected 1980 and projected 2020 conditions. Cultural practices typical of the area were incorporated into the budgets. Seasonal growth curves based on a full water supply were developed for each crop and then used to plot net return curves. In the case of alfalfa for instance, the first year alfalfa production was less than the second year which was estimated as maximum after which potential production decreased to the fifth year when it was projected to be equal to the first year's production. Production dropped off rather sharply for each succeeding year after that.

After developing net return curves, points were read off the curves corresponding to length of crop growth and provided as input to the irrigation program for analysis. This program correlates water supply and potential crop production response with levels of crop root-zone water. A basic assumption employed by the program is for crop production to continue so long as water is available but ceases when irrigation water, soil storage, or precipitation becomes insufficient. Water applied after this cut-off date could be used for perennial crop maintenance or to fill the soil profile or both, but could not generate crop production during the current year.

The irrigation program illustrates water supply, consumptive use requirements, actual crop consumptive use, water deficits and net returns. Using a constant water supply and the same net return curves, the affect attributed to land treatment and canal lining was measured by changing irrigation efficiency. Land treatment was considered the first development unit and canal lining second. The difference between each level of development was estimated as the primary project benefits associated with that development increment.

RESOURCE CONSERVATION AND USE

The combined net effect of applying the going and accelerated programs for both on-farm land treatment and off-farm canal lining developments by 1980 could be an increase in overall irrigation efficiency of 18 percent. An additional potential increase of 9 percent could be realized beyond 1980 (Table 1). The increase in overall irrigation efficiency from the application of the going and accelerated programs could decrease the average annual root-zone consumptive use deficit 32,750 acre-feet by 1980 with an additional potential decrease of 11,500 acre-feet beyond 1980 (Table 2).

TABLE 1.--Increased overall irrigation efficiency through on-farm land treatment and off-farm canal lining,[a] Beaver River Basin

Subbasin	Existing efficiency (1965)	Development potential[b]	Opportunities for development by 1980[b]		
			Going	Accelerated	Total
	Percent	Percent	Percent	Percent	Percent
Fillmore (2A)	35	25	11	6	17
Beaver-Milford (2B)	32	29	14	8	20
Cedar-Parowan (2B1)	28	28	12	6	18
Escalante Desert (2B2)	36	23	12	2	14
Basin Average	33	27	12	6	18

[a]Includes canal lining and pipelines
[b]In addition to existing efficiencies in 1965

TABLE 2.--Decreased average annual root-zone consumption use deficits through increased irrigation efficiencies, Beaver River Basin[a]

Subbasin	Existing C.U. deficit	Development potential	Opportunities for Development by 1980		
			Going	Accelerated	Total
	Acre-feet				
Fillmore (2A)	26,390	11,840	5,810	2,940	8,750
Beaver-Milford (2B)	12,400	11,120	8,610	1,520	10,130
Cedar-Parowan (2B1)	20,360	11,340	5,380	2,240	7,620
Escalante Desert (2B2)	18,610	9,950	5,170	1,080	6,250
Basin Total	77,760	44,250	24,970	7,780	32,750

[a]Based on Irrigation (ADP) Program Analysis

On-Farm Land Treatment

Land treatment has made proper use and management of irrigated land possible. Land treatment measures evaluated are field ditches, land leveling, ditch lining, pipeline, irrigation structures and sprinkler systems. Most of the irrigated land needs additional land treatment. Increased irrigation efficiencies by application of land treatment measures were evaluated (Table 3). Existing on-farm land treatment, opportunities for development by 1980, and potentials beyond 1980 are identified (Table 4). Going programs were based on a projection of land treatment accomplishments over a recent 10 year period.

TABLE 3.--Increased on-farm irrigation efficiency through land treatment, Beaver River Basin

Subbasin	Existing efficiency (1965)	Development potential[a]	Opportunities for development by 1980[a]		
			Going	Accelerated	Total
	Percent	Percent	Percent	Percent	Percent
Fillmore (2A)	46	16	8	3	11
Beaver-Milford (2B)	45	19	12	3	15
Cedar-Parowan (2B1)	40	18	8	4	12
Escalante Desert (2B2)	44	17	10	2	12
Basin Average	44	18	10	3	13

[a]In addition to existing efficiencies in 1965.

TABLE 4.--On-farm land treatment, Beaver River Basin

Subbasin	Land treatment measure	Unit	Existing (1965)	Development potential[a]	Opportunities for development by 1980		
					Going	Accelerated	Total
Fillmore (2A)	Field ditches	Miles	140	165	39	68	107
	Land leveling	Acres	14,500	6,700	4,500	0	4,500
	Ditch lining	Miles	40	132	44	42	86
	Pipelines	Miles	13	65	33	17	50
	Irr. structures	No.	7,300	21,660	6,450	4,550	11,000
	Sprinkler sys.	Acres	1,100	5,500	3,400	500	3,900
Beaver-Milford (2B)	Field ditches	Miles	204	113	15	60	75
	Land leveling	Acres	12,400	10,400	5,700	2,300	8,000
	Ditch lining	Miles	38	162	85	12	97
	Pipelines	Miles	19	42	11	14	25
	Irr. structures	No.	6,600	18,760	10,000	1,090	11,090
	Sprinkler sys.	Acres	700	4,600	3,000	1,000	4,000
Cedar-Parowan (2B1)	Field ditches	Miles	81	181	32	39	71
	Land leveling	Acres	10,700	6,800	3,100	2,000	5,100
	Ditch lining	Miles	28	110	11	14	25
	Pipelines	Miles	5	73	17	12	29
	Irr. structures	No.	2,600	26,500	3,000	7,200	10,200
	Sprinkler sys.	Acres	600	5,300	3,300	0	3,300
Escalante Desert (2B2)	Field ditches	Miles	100	223	38	49	87
	Land leveling	Acres	13,200	8,200	4,050	2,250	6,300
	Ditch lining	Miles	59	124	21	9	30
	Pipelines	Miles	15	68	27	8	35
	Irr. structures	No.	3,000	30,200	4,500	8,000	12,500
	Sprinkler sys.	Acres	700	6,300	4,000	0	4,000
Basin Total	Field ditches	Miles	534	682	124	216	340
	Land leveling	Acres	50,800	32,100	17,350	6,550	23,900
	Ditch lining	Miles	174	528	161	77	238
	Pipelines	Miles	52	248	88	51	139
	Irr. structures	No.	19,500	97,120	23,950	20,840	44,790
	Sprinkler sys.	Acres	3,100	21,700	13,700	1,500	15,200

a In addition to existing developments in 1965.

Off-Farm Conveyance Systems

Irrigation companies and systems were inventoried and mapped. Information obtained included: miles of main canal including major laterals of company maintenance responsibility, existing lining and pipelines, condition of systems, problems, and improvement opportunities and potentials. Additional information is given in the "Irrigation Systems Supplement" to this Appendix.

Total irrigation conveyance systems amount to 420 miles. Individual drainages may have many private diversions hence short ditches serving individual users which are not included within the 420 mile total. Part has been lined or piped, some does not require it and the balance should be lined by some method. Development potentials for canal lining and pipelines are based on erosion hazard and conveyance losses. Other important considerations in determining whether to line or pipe a canal could include safety hazard, timing, operation costs, and riparian vegetation control, but these were not evaluated. Replacement of presently lined or piped canals and consolidation of overlapping or parallel canal systems could increase conveyance efficiencies but these were not evaluated.

Existing canal lining and pipeline opportunities for development by 1980, and development potentials are identified (Table 5). Increased irrigation conveyance efficiency from this development is indicated in Table 6. A projection of canal lining and pipelines through going programs was made on the basis of accomplishments in a recent 10 year period.

TABLE 5.--Irrigation Company Canal Lining[a], Beaver River Basin

Subbasin	Existing (1965) Canal length[a]	Existing (1965) Canal lining[b]	Development potential[c]	Opportunities for development by 1980[c] Going	Accelerated	Total
	Miles	Miles	Miles	Miles	Miles	Miles
Fillmore (2A)	91	28	55	22	17	39
Beaver-Milford (2B)	185	13	154	29	58	87
Cedar-Parowan (2B1)	117	42	65	28	17	45
Escalante Desert (2B2)	27	14	13	9	0	9
Basin Total	420	97	287	88	92	180

[a]Includes sum of all Irrigation Company canals and laterals.
[b]Includes canal lining and pipelines.
[c]In addition to existing canal lining in 1965.

TABLE 6.--Increased off-farm irrigation conveyance efficiencies through canal lining,[a] Beaver River Basin

Subbasin	Existing efficiency (1965)	Development potential[b]	Opportunities for development by 1980[b] Going	Accelerated	Total
	Percent	Percent	Percent	Percent	Percent
Fillmore (2A)	77	19	9	5	14
Beaver-Milford (2B)	70	25	10	10	20
Cedar-Parowan (2B1)	70	26	13	6	19
Escalante Desert (2B2)	83	13	6	0	6
Basin Average	74	22	10	6	16

[a]Includes off-farm canals and laterals of irrigation companies and groups.
[b]In addition to existing efficiencies in 1965.

COST ANALYSIS

The on-farm land treatment and off-farm canal lining will significantly reduce water deficits on irrigated land. This will increase crop production and farm income. The going land treatment and canal lining programs and the accelerated land treatment and canal lining programs are projected to cost $8,873,100 and $5,354,900 respectively based on 1970 prices. Installation costs were converted to annual costs using an interest rate of 5½ percent with a projected life of 100 years. Replacement, operation and maintenance costs were computed and added to the amortized installation costs to derive total annual costs. Values are shown for both on-farm land treatment and off-farm canal lining.

Evaluations for on-farm land treatment are based on increased crop production resulting from increased crop root-zone water supply. Each practice applied could result in incremental increases in irrigation efficiency. Costs were computed separately for each measure. Canal lining and pipeline costs were based on specific canal lengths and aggregated by subbasins. Benefits could result from increased crop production through better irrigation conveyance efficiency. Total installation costs and annual costs of going and accelerated programs for land treatment and canal lining are given in Table 7.

TABLE 7.--Costs of land treatment and canal lining, 1965-1980, Beaver River Basin

Subbasin & Basin	Land Treatment Costs		Canal Lining Costs	
	Installation	Average annual[a]	Installation	Average annual[a]
Going				
2A Fillmore	1,779,900	118,290	734,400	54,720
2B Beaver-Milford	1,893,000	131,020	770,500	54,220
2B1 Cedar-Parowan	1,060,800	67,280	928,700	64,930
2B2 Escalante Desert	1,492,300	92,540	213,500	15,310
Basin	6,226,000	409,130	2,647,100	189,180
Accelerated				
2A Fillmore	946,300	66,230	520,000	38,180
2B Beaver-Milford	703,100	45,060	1,374,900	99,860
2B1 Cedar-Parowan	681,500	46,400	528,200	39,000
2B2 Escalante Desert	600,900	40,810	0	0
Basin	2,931,800	198,500	2,423,100	177,040

[a]Price base 1970 at 5½ percent interest for 100 years. Replacement costs were considered in developing the annual equivalent costs.

ENVIRONMENTAL EVALUATION

Installation of canal lining and pipelines would reduce the growth of riparian vegetation along canals and ditches and in turn decrease habitat for wildlife. More efficient use of irrigation water by installation of land leveling and sprinkler systems would reduce tail water from irrigated areas which now provide a portion of the annual consumptive use of the surrounding native vegetation. These measures will reduce ditches, borders, and other odd areas which provide food and cover for wildlife.

Increased cropland root-zone supply and adjustment in timing of irrigation water will provide a means to increase the number of green fields and extend the period of growth into the fall, thus enhancing the pastoral setting. On the other hand, more efficient use of the irrigation supply and altering the time of the available supply will increase water use and decrease the recharge to the ground-water reservoirs.

The decrease in ground-water recharge will add to the already declining water table. This decrease in water level is reducing the artesian pressure of wells in some areas.

RESERVOIRS

Sites for surface water storage were evaluated on the basis of geology, availability of water, topography, local interest and better utilization of water resources. Many potential reservoir storage sites have been investigated by various agencies and individuals. Sediment, irrigation and recreation storage were inputs into an evaluation program, while flood storage was entered as a constant or computed. Irrigation storage was based upon either storing winter streamflows or storing unused spring diversions for release in the summer. Reservoir storage will increase water use and decrease the ground-water recharge. However, data were not available to adequately analyze and evaluate the effects. Additional discussion is given at the beginning of this chapter and in Appendix IV.

The storage within a reservoir was analyzed by purpose. Irrigation storage was determined by the availability of storable water. Flood storage capacities were based on Soil Conservation Service design criteria. Limited field studies of the geology and sediment yield of selected sites were made. Fishery capacities were based on minimum requirements that would insure year round fish habitat. A depth of 10 feet above the sediment pool at the dam was selected as the minimum fish pool. Increments of storage for each purpose were added to determine structure size.

A total of 84 existing reservoirs within the Basin provide 50,566 acre-feet of storage with a surface area of 2,677 acres. Present recreation use and projected demands are discussed in Appendix II. Approximately 51 potential reservoir sites were identified which could provide 133,429 acre-feet of storage with 5,109 acres of surface area. Of these, 13 sites, which appeared favorable, were selected for further evaluation and analysis as alternative opportunities within the next 10-15 years.

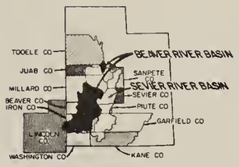
Table 8 lists a summary of existing reservoirs, potential sites, and development opportunities. The map following page 12 shows the location of existing and potential reservoirs. Additional information about existing reservoirs is given in Appendix II. Considerable information is available on some sites while very little is available on others. Table 9 provides a summary of potential reservoirs with information as to location, capacity, drainage area, purpose, and a source where additional information may be obtained.

RESOURCE CONSERVATION AND USE

Development opportunities by 1980 for 13 selected reservoirs include flood and sediment storage, irrigation water storage, and storage for recreation. Nine of the reservoirs could provide 7,310 acre-feet of irrigation water storage. Eleven could provide approximately 600 surface acres and 9,650 acre-feet for recreational use. An additional 214 surface acres and 7,310 acre-feet allocated for irrigation storage could be available for recreational use for short periods early in the season and part of the 3,700 acre-feet allocated for sediment storage could be available during the life of the structures. Also, 2,590 acre-feet of temporary flood flow detention is allocated. Total storage provided is 25,249 acre-feet and 897 surface acres (Table 10). In addition, the regulatory aspect of the reservoirs would permit a less varying flow from day to night.

Reservoirs could provide an opportunity to reduce potential flood damages. Allotted storage for flood prevention provides a means of reducing peaks of short duration summer storms. Snowmelt floods and summer storms with an extended hydrograph have too large a volume to be affected by the small allotted flood storage. During July and August when most summer storms occur, a portion of the allotted irrigation storage which has been vacated could be used to reduce flood peaks.

The 100-year and 50-year summer flood hydrographs were routed through structures on Chalk Creek, North Creek, Beaver River, Indian Creek and Shoal Creek to evaluate the quantitative effect of flood storage (Table 11). Flood reduction benefits from use of part of the irrigation storage were not evaluated.



LOCATION MAP

LOCATION MAP OF SUB-BASINS

LEGEND

Existing	Potential beyond 10-15 years	Potential within 10-15 years	
			Capacity (Ac.-Ft.)
			< 100
			100 – 1,000
			1,000 – 10,000
			> 10,000
28-1a	28-1b	28-1b	Identification Number

POTENTIAL AND EXISTING RESERVOIRS

SOUTH PORTION

BEAVER RIVER BASIN

UTAH - NEVADA

July, 1972

SCALE IN MILES 5 0 5 10

TABLE 8.--Summary of storage reservoirs, Beaver River Basin

Subbasin	Development	Unit	Existing Reservoirs (1965)[c]	Development potential[d]	Opportunities for development by 1980[d]		
					Going	Accelerated	Total
Fillmore (2A)	Site	No.	6	8	0	3	3
	Storage[a]	Ac.Ft.	166	37,043	0	13,843	13,843
	Surface Area[b]	Acre	21	1,188	0	360	360
Beaver-Milford (2B)	Site	No.	42	13	0	4	4
	Storage	Ac. Ft.	29,750	15,081	0	5,910	5,910
	Surface Area	Acre	1,657	529	0	182	182
Cedar-Parowan (2B1)	Site	No.	15	16	0	1	1
	Storage	Ac.Ft.	4,913[e]	39,045	0	1,100	1,100
	Surface Area	Acre	282[e]	1,620	0	59	59
Escalante Desert (2B2)	Site	No.	11	14	1	4	5
	Storage	Ac.Ft.	14,990	42,260	1,680	2,716	4,396
	Surface Area	Acre	622	1,772	122	174	296
Sevier Lake (2)	Site	No.	10	0	0	0	0
	Storage	Ac.Ft.	747	0	0	0	0
	Surface Area	Acre	95	0	0	0	0
Basin Total	Site	No.	84	51	1	12	13
	Storage	Ac.Ft.	50,566	133,429	1,680	23,569	25,249
	Surface Area	Acre	2,677	5,109	122	775	897

a Includes storage for irrigation, recreation, flood control, municipal, industrial and other purposes.
b Surface area at emergency spillway level.
c Additional data available in Appendix II.
d Some sites may serve as alternatives to others, additional data given in Tables 9 and 10.
e Does not include Little Salt Lake and Quichapa Lake.

TABLE --Potential reservoirs, Beaver River Basin, 1965

Name	Number[a]	Stream	Location T	R	S	Capacity	Surface area	Drainage area	Purpose[b]	Remarks	Source of information[c]
						Ac. ft.	Acres	Sq. mi.			
Chalk Creek Watershed (2A-24)											
Upper Chalk Creek	2A-24b	Chalk Creek	21S	4W	28	4,000	100	60.0	I, FC, S		SCS
Lower Chalk Creek	2A-24a	Chalk Creek	21S	4W	27	7,444	152	58.0	R, I, FC, S, M&I	e	SCS
Chalk Creek Delta	2A-24c	Chalk Creek	20S	5W	36	15,000	620	94.0	I, R		SCS
Corn Creek Watershed (2A-25)											
Adelaide Lower	2A-25a	Corn Creek	23S	5W	35	2,500	46	87.0	I, FC, S		SCS
Adelaide Upper	2A-25b	Corn Creek	24S	4¾W	5	1,000	35	85.0	I, FC, S		SCS
Big Hollow	2A-25c	Big Hollow, Corn Creek	24S	4W	4	4,034	142	2.2	I, R	e	SCS
Cottonwood	2A-25d	Second Creek, Corn Creek	24S	4¾W	8	2,365	66	12.2	I, FC, R	e	SCS
Wide Hollow	2A-25f		23S	6W	31	700	27	20.0	FC, S, R		SCS
Beaver Watershed (2B-1)											
Britt's Meadow	2B-1a	Lake Stream	29S	5W	15	1,660	(80)[d]		I, FC		U
Dry Flat	2B-1b	East Fork or Beaver River	30S	5W	1	112	(8)				U
Lewis Power #1	2B-1c	Beaver River	29S	6W	20	930	(50)		P		U
Lewis Power #2	2B-1d	Beaver River	29S	6W	20	935	(50)		P		U
Lewis Power #3	2B-1f	Beaver River	29S	6W	28	214	15		P		U
North Fork North Creek	2B-1h	North Fork North Creek	28S	6W	10	620	(36)				U
North Creek	2B-1k	North Creek	28S	6W	29	790	26	14.1	I, FC, R	e	SCS
South Creek	2B-1j	South Creek	30S	7W	2						U
Three Creek Lower	2B-1g	Beaver River	29S	5W	17	3,220	84	37.8	FC, R	e	SCS
Three Creek Upper	2B-1m	Beaver River	29S	5W	9	4,700	108	17.0	I, FC	Enlargement	USGS
Wildcat Creek Watershed (2B-2)											
Indian Creek Diversion	2B-2b	Indian Creek	27S	7W	35	1,110	40	19.9	I, FC, R	e	SCS
Milk Ranch Reservoir	2B-2a	Indian Creek	27S	6W	34	800	32	8.8	I, R	e	SCS
Milford Watershed (2B-4)											
Fartheringham	2B-4a	Beaver River	27S	16W	1B						
Coal Creek Watershed (2B1-1)											
Ashdown Creek	2B1-1a	Ashdown Creek, Coal Creek	36S	10W	36	10,000	(400)		F, R, FC, I		SCS
Bauer	2B1-1b	Jones Ditch	35S	11W	34	40	10		I		U
Blue Valley	2B1-1c	Blue Valley Creek	37S	12W	17	180	(13)	5.0	FC, I		SCS
Center Creek	2B1-1d	Bowery Fork, Center Creek	35S	8W	9	150	(11)		I, R, F	Aka Yankee Meadow Alt.	SCS
Dry Canyon	2B1-1f	Dry Canyon	36S	11W		150	(11)	3.0	FC		
Fiddlers	2B1-1g	Fiddlers Canyon	35S	11W	36	500	(30)	12.0	FC		
Hamilton Fort	2B1-1h	Shurtz Creek	36S	11W	29	400	(25)	7.0	FC, I		SCS
Harris Gubler	2B1-1j					31	(3)				
Jenny Beck	2B1-1m	Center Creek	36S	9W	2						
Parawoo	2B1-1n	City Creek	34S	9W	15	6,000	(260)	70.0	I, FC		SCS
Red Hill	2B1-1p	Coal Creek	36S	11W	13	17,000	(630)	81.0	FC, S, I, F, R, M&I	f	SCS
Shurtz	2B1-1q	Shurtz Creek	37S	11W		300		7.0			
Summit	2B1-1r	Summit Creek	34S	10W	36	1,500	(80)	24.0	I, FC		SCS
Urie	2B1-1s	South Creek, Coal Creek	37S	10W	8						
Yankee Meadows	2B1-1t	Center Creek	35S	8W	20	1,225	61	7.0	I, R, F,	Enlargement	USGS
Misc. DB's	2B1-1u	Near Cedar	36S	11W		500	(30)	10.0	FC		SCS
Red Creek Watershed (2B1-3)											
Little Creek	2B1-3a	Little Creek	33S	7W	32	1,100	59	11.8	I, R	e	SCS
Pinto Creek Watershed											
Blue Grass Flat	2B2-1a	Little Pinto, Pinto Creek	36S	15W	26,27	9,467	351	126.0	I		USGS
Herdhouse	2B2-1b	Pinto Creek	37S	15W	2,3	569	45	47.0	I		USGS
Holt Canyon	2B2-1c	Meadow Creek	37S	16W	10	1,250	80	31.7	I, R	e	SCS
Newcastle	2B2-1f	Pinto Creek	36S	15W	22	26,000	(975)	133.0	I	Enlargement	SCS
Pinto	2B2-1g	Pinto Creek	37S	15W	27	(500)	(30)		I		SCS
Upper Pinto	2B2-1h	East Fork, Pinto Creek	38S	15W	1	1,060	57	10.3	R	e	SCS
Shoal Creek Watershed											
Calf Springs	2B2-2a	Calf Springs Creek	37S	17W	27	601	36	12.00	Mult.		USGS
Cottonwood	2B2-2b	Cottonwood Creek	37S	16W	29						
Holt	2B2-2c	Shoal Creek	37S	17W	16			111.00			SCS
Indian Rock	2B2-2f	Shoal Creek	37S	17W	7	1,680	122	102.00	FC, S, R, I	e	SCS
Spring Creek Reservoir	2B2-2g	Spring Creek	37S	17W	25,26	727	39	12.00	I		USGS
Undercurrent	2B2-2h	Shoal Creek	37S	17W	17			108.00			SCS
Lost Creek	2B2-2j	Lost Creek	38S	18W	4	256	20	6.4	FC, S	e	SCS
Cave Creek	2B2-2k	Cave Creek	38S	18W	10	150	17	2.6	FC, S	e	SCS

[a]Number is for map location and identification only.

Major Purpose: F - Fishing; FC - Flood Control; I - Irrigation; MI - Municipal and Industrial; P - Power; R - Recreation; S - Sediment; St - Stockwatering.

[c]Source of Information: CNI - Conservation Needs Inventory (unpublished report); SCS - Soil Conservation Service Work Unit or River Basin Staff; U - Utah State Engineer Biennial Reports; USGS - United States Geological Survey, Water Supply Paper 920.

[d]Values in parentheses () are estimated.

[e]Reconnaissance investigation and evaluation made by Soil Conservation Service during river basin study.

[f]Preliminary investigation made by Soil Conservation Service during watershed planning.

TABLE 10.--Summary of data for reservoir alternative opportunities (10-15 years), Beaver River Basin

Reservoir site	Class of Struc.[a]	Drainage Area	Height of Dam	Volume of Fill	Pr.Sp.[b] Release Rate	Emergency Spwy. Type	Emergency Spwy. Chance of use[c]	Surface Area Recre. Pool	Surface Area Em. Sp. Level	Surface Area Req. for Constr.	Storage Capacity[d] Flood Prevention Sedi.[e]	Storage Capacity[d] Flood Prevention Flood	Storage Capacity[d] Flood Prevention Total	Storage Capacity[d] Irrig.	Storage Capacity[d] Recrea.	Storage Capacity[d] M & I	Storage Capacity[d] Total
		sq.mi.	feet	cu.yd.	csm		Percent	Acre	Acre	Acre	Ac.Ft.	Ac.Ft.	Ac.Ft.	Ac.Ft.	Ac.Ft.	Ac.Ft.	Ac.Ft.
2A-24a Chalk Cr. Upper	c	58	136	1,788,500	6.0	R/C & Rock	50	70	152	208	900	444	1,344	3,000	1,100	2,000	7,444
2A-25c Big Hollow	b	2.2	81	251,500	37.3	R/C & Rock	1	62	142	150	100	234	334	2,200	1,500	-	4,034
2A-25d Cottonwood	c	12.2	105	535,400	8.3	R/C & Rock	1	57	66	79	180	515	695	170	1,500	-	2,365
2B-1g Lower Three Cr.	c	37.8	105	607,900	6.7	R/C	50	81	84	105	450	220	670	-	2,550	-	3,220
2B-1k North Creek	c	14.1	87	260,000	6.2	R/C	50	21	26	33	140	100	240	250	300	-	790
2B-2b Indian Creek	c	19.9	83	450,400	7.5	R/C	50	30	40	58	200	100	300	300	500	-	1,100
2B-2a Milk Ranch	c	8.8	84	91,600	9.0	R/C	50	23	32	42	100	100	200	300	300	-	800
2B1-3a Little Creek	b	11.8	71	116,100	7.2	R/C & Rock	50	43	59	76	200	100	300	340	460	-	1,100
2B2-1c Holt Canyon	b	31.7	54	221,900	2.7	R/C	50	66	80	125	600	200	800	250	200	-	1,250
2B2-1h Upper Pinto	b	10.3	64	78,600	7.7	R/C & Rock	50	54	57	74	120	100	220	-	840	-	1,060
2B2-2f Indian Rock	c	102	57	201,800	0.7	R/C & Rock	50	97	122	214	600	180	780	500	400	-	1,680
2B2-2j Lost Creek	b	6.4	45	71,300	10.5	R/C & Rock	1	-	20	27	60	196	256	-	-	-	256
2B2-2k Cave Creek	b	2.6	26	11,700	19.5	R/C & Rock	1	-	17	23	50	100	150	-	-	-	150
TOTAL	-	317.8	-	4,686,700	-	-	-	604	897	1,214	3,700	2,599	6,289	7,310	9,650	2,000	25,249

a Class (a)-Structure located in rural or agricultural areas where failure may damage farm buildings, agricultural land, or township and country roads.
Class (b)-Structure located in predominantly rural or agricultural areas where failure may damage isolated homes, main highways or minor railroads or cause interruption of use or service or relatively important public utilities.
Class (c)-Structure located where failure may cause loss of life, serious damage to homes, industrial and commercial buildings, important public utilities, main highways or railroads.

b All principal spillways were designed using reinforced concrete conduits.

c Percent chance of use based on 100 year period, i.e. one percent chance would be a frequency of use of once every 100 years.

d Tentative capacities and allocations based upon preliminary investigations.

e Sediment retention capacity for 50 years.

TABLE 11.--Reduction of flood peaks from routing summer storms through potential reservoirs, Beaver River Basin

Reservoir site	Drainage	Flood frequency (Percent)	Flood peak before structure installation (cfs)	Maximum reservoir release[a] (cfs)
2A-24a				
Upper Chalk Creek	Chalk Cr.	1	3,000	310
		2	2,500	160
2B-1g				
Lower Three Creeks	Beaver R.	1	1,490	230
		2	800	60
2B-1k				
North Creek	No. Creek	1	1,290	480
		2	720	80
2B-2b				
Indian Creek	Indian Cr.	1	1,050	340
		2	650	90
2B2-2f				
Indian Rock	Shoal Cr.	1	3,600	1,450
		2	2,150	660

[a] For the storms listed.

Upper Chalk Creek (2A-24a)

This reservoir alternative (7,444 acre-feet) would require relocation of 1½ miles of paved road and use of 208 acres of meadow, irrigated cropland and stream bottom for construction and storage. Storage of Chalk Creek diversions during November through March and using a demand system for reservoir releases could provide 3,000 acre-feet of irrigation storage and 2,000 acre-feet of municipal storage five out of ten years. The 2,000 acre-feet allocated for municipal use will provide late season water for irrigation of lawns and gardens and supplement existing supplies to meet current and anticipated demands. A surface system is presently used to convey and distribute water to city lots; late season water is usually in short supply. When this occurs, culinary water is used to supplement irrigation of city lots. The projected capacity of the 70 acre recreation pool is 12,000 visitor-days. Approximately 900 acre-feet would be required for sediment storage.

Big Hollow (2A-25c)

This reservoir alternative of 4,034 acre-feet would require 150 acres of sagebrush covered rangeland in the upper watershed area of Corn Creek. The natural drainage at this site is 2.2 square miles; 100 acre-feet of storage would be required for the 50-year sediment yield. Water for storage would be diverted from a large spring in an adjacent drainage which would reduce the base flow of Corn Creek by four cubic feet per second. If no winter releases were made from this site, Corn Creek would have little or no flow during part of the year. Irrigation storage of 2,200 acre-feet would provide a surface area of 137 acres. The projected capacity of the 62 acre recreation pool is 3,200 visitor-days.

Cottonwood (2A-25d)

This reservoir alternative of 2,365 acre-feet could provide an opportunity for irrigation storage of 170 acre-feet, five out of ten years. This storage is equal to the excess irrigation supply from the watershed above the structure. This reservoir would require 180 acre-feet of sediment storage. The 1,500 acre-feet of recreation storage would provide a surface area of 57 acres and a projected capacity of 5,200 visitor-days. Construction would require relocation of one mile of gravel road. It would use 79 acres of sagebrush land with scattered stands of juniper, oak, pine, and aspen. Base flow of approximately 0.5 cubic feet per second would be intercepted by the reservoir. Downstream fisheries immediately below the reservoir would be interrupted. Reservoir seepage and flow of small springs should provide a perennial stream within one to two miles of the dam.

Lower Three Creeks (2B-1g)

This reservoir alternative of 3,220 acre-feet would provide an opportunity to store 2,550 acre-feet for recreation. Because of the water rights constraints on the Beaver River, reservoir capacity was not allotted for irrigation. The reservoir would normally not fluctuate and would provide a recreation pool of 81 surface acres and a projected capacity of 13,100 visitor-days. Reservoir construction would require relocation of two miles of gravel road. This would use 105 acres of sagebrush, pine, fir, and aspen covered land. Approximately 450 acre-feet of storage would be required for the estimated 50 year sediment yield.

North Creek (2B-1k)

Generalized geology reports of this site indicate that it is a poor site and would require extensive work to allow for safe use. Only small volumes should be retained beyond over-night storage. Therefore, a

relatively small (790 acre-feet) capacity was evaluated. A continuous flow of water would be available at the site primarily to freshen up the pool as all of the flow is appropriated during the irrigation season. Excess irrigation supply from North Creek was estimated to be 250 acre-feet five out of ten years and this value was allocated for irrigation storage. During the 1956-1965 period, there were four years with no excess diversions. A 300 acre-feet recreation pool would provide 21 surface acres and a projected capacity of 2,200 visitor-days. Approximately 33 acres would be required for the reservoir construction. The estimated 50-year sediment yield would require 140 acre-feet of storage capacity.

Indian Creek (2B-2b)

This reservoir alternative of 1,100 acre-feet would require relocation of one mile of gravel road and would use 58 acres of mostly sagebrush land for construction. A preliminary geologic investigation indicates that this is a poor site and would require extensive work for safe use. Excess irrigation supply in the spring is estimated at 300 acre-feet five out of ten years. Storage allocations are 300 acre-feet for irrigation, 500 acre-feet for recreation and 200 acre-feet for sediment. The projected capacity of the 30 acre recreation pool is 3,500 visitor-days. This site is an alternate to the Milk Ranch site for storage of irrigation water.

Milk Ranch (2B-2a)

The 42 acres that would be required for construction of this 800 acre-foot reservoir includes a meadow pasture and some fir, pine, and aspen covered land. Relocation of about one-half mile of gravel road would be required. Storage would provide 300 acre-feet for irrigation, 300 acre-feet for recreation, and 100 acre-feet for sediment. The projected capacity of the 23 acre recreation pool is 3,500 visitor-days. This site is an alternate to the Indian Creek site and the water for irrigation would be available for only one site.

Little Creek (2B1-3a)

This reservoir alternative of 1,100 acre-feet would provide an opportunity to store winter flows of Little Creek from October through March. These flows are estimated to average 340 acre-feet. Average annual flows of Little Creek were estimated at 1,930 acre-feet. Excess diversions were estimated to be 65 acre-feet or less five out of ten years. This reservoir would require relocation of one mile of dirt road and 76 acres for construction which includes sagebrush and grass cover. Storage would include 340 acre-feet for irrigation, 460 acre-feet for recreation, and 200 acre-feet for sediment. The projected capacity of the 43 acre recreation pool is 5,600 visitor-days.

Upper Pinto (2B2-1h)

This reservoir alternative of 1,060 acre-feet would provide an opportunity to store 840 acre-feet for recreation with a pool of 54 acres and a projected capacity of 3,500 visitor-days. Sediment storage of 120 acre-feet would provide additional recreation storage while the sediment pool is filling. Irrigation storage was not included. The reservoir would require 74 acres for construction which includes sagebrush, juniper, and a small amount of meadow grass.

Holt Canyon (2B2-1c)

Preliminary geologic investigations indicate that this is a poor site for major water storage and extensive work would be required to provide safe storage. There is an opportunity for storage of 250 acre-feet of irrigation water. Also, 200 acre-feet of recreation storage can be provided; and due to high sediment yields from the watershed, 600 acre-feet of sediment storage would be required. The projected capacity of the 66 acre recreation pool is 2,000 visitor-days. Approximately 125 acres of sagebrush and juniper covered rangeland would be required for the reservoir.

Indian Rock (2B2-2f)

This 1,680 acre-feet reservoir alternative on Shoal Creek would provide an opportunity to store 500 acre-feet for irrigation. This storage would amount to nearly all of the yield of the Shoal Creek watershed below the Enterprise Reservoirs. Interception of the flow of local springs would provide the main source of storable water. Also provided would be storage of 400 acre-feet for recreation and 600 acre-feet for sediment. The projected capacity of the 97 acre recreation pool is 3,000 visitor-days. The 214 acres required to build the project includes some pasture, cropland and rangeland. Construction would require relocation of one mile of paved road.

Lost Creek (2B2-2j) & Cave Creek (2B2-2k)

The two debris basins located on tributaries above the Enterprise reservoirs would provide opportunity to reduce sediment inflow to the Enterprise reservoirs by 110 acre-feet. This would require 50 acres of sagebrush covered rangeland and relocation of one mile of dirt road.

COST ANALYSIS

Costs were allocated to each purpose served by a structure. Costs included construction, engineering, and land rights related to each reservoir. Road relocation and other construction costs to replace like facilities that were displaced by a reservoir are also included. Not included, are costs related to recreation to improve access to reservoirs to a desirable standard; to provide boat ramps, sanitation, or other facilities; and to provide administration of recreation at these sites.

At this level of investigation the reservoir alternatives that appear feasible were Upper Chalk Creek, Big Hollow, Little Creek, Upper Pinto, and Indian Rock. All others have less than 1:1 benefit-cost ratio. Reservoir installation costs are given in Table 12, and annual costs in Table 13.

TABLE 12.--Reservoir costs by purpose, Beaver River Basin

Reservoir site	Purpose			
	Flood prevention	Recreation	Irrigation	Total
	----------Dollars----------			
Upper Chalk Creek	635,040	529,200	2,363,760[a]	3,528,000
Big Hollow	74,340	343,800	511,060	929,200
Cottonwood	509,100	1,069,100	118,800	1,697,000
Lower Three Creek	601,660	2,263,340	0	2,865,000
North Creek	294,010	372,390	313,600	980,000
Indian Creek	512,200	512,180	872,620	1,897,000
Milk Ranch	161,240	238,660	245,100	645,000
Little Creek	135,400	210,640	155,460	501,500
Holt Canyon	644,930	161,230	201,540	1,007,700
Upper Pinto	77,980	293,320	0	371,300
Indian Rock	326,140	170,160	212,700	709,000
Lost Creek	297,700	0	0	297,700
Cave Creek	106,300	0	0	106,300
Total	4,376,040	6,164,020	4,994,640	15,534,700

a Estimate includes $952,560 allocated to municipal water storage.

TABLE 13.--Reservoir annual costs, Beaver River Basin

Reservoir site	Amortized cost[a]	Operation & maintenance	Total annual
	----------Dollars----------		
Upper Chalk Creek	208,360	17,640	226,000
Big Hollow	54,880	4,650	59,530
Cottonwood	100,220	8,480	108,700
Lower Three Creek	169,200	14,320	183,520
North Creek	57,880	4,900	62,780
Indian Creek	112,040	9,480	121,520
Milk Ranch	38,100	3,220	41,320
Little Creek	29,620	2,510	32,130
Holt Canyon	59,510	5,040	64,550
Upper Pinto	21,930	1,860	23,790
Indian Rock	41,870	3,540	45,410
Lost Creek	17,580	1,490	19,070
Cave Creek	6,280	530	6,810
Total	917,470	77,660	995,130

a Installation cost amortized for 50 years at 5½ interest.

ENVIRONMENTAL EVALUATION

The effects of the reservoir developments are generally favorable, but there are some adverse effects. The 13 reservoir opportunities would require 1,214 acres for construction. Approximately 174 acres would be inundated and then exposed annually by fluctuating reservoir levels. Some sites are now very scenic, have a present high level of recreation use, and have intrinsic values that would be replaced by values associated with additional flat water. Construction would require excavation that would be visible until revegetation is accomplished. Construction could cause minor inconvenience to traffic. Relocation of nine miles of roads could have an impact on existing streams, fish and wildlife habitat and esthetic values. Careful timing in construction should eliminate any disruption in delivery of irrigation water. Water quality and fish habitat downstream would be affected. Noise, dust, and smoke during construction would have a minor temporary effect. Fishing and fish habitat would be improved in some areas and reduced in others. Increased recreational use could cause greater pollution and create the need for more controls and services. Further studies regarding recreation impact on watershed resources should be initiated prior to construction of reservoirs. Additional environmental evaluation of each proposed reservoir is given in Table 14 and in the following narrative.

TABLE 14.--Environmental impacts for future evaluations of 13 selected reservoir developments, Beaver River Basin[a]

Aspect	Effect or Impact
Ecological	Provide 600 acres and 9,650 acre-feet of reservoir fish habitat
	Eliminate 5 miles of stream fish habitat
	Improve 19 miles of stream fish habitat
	Reduce value of 6 miles of stream fish habitat
	Destroy 1,200 acres of various wildlife habitat
	Provide 600 acres of water surface for waterfowl habitat
	Change land use on 1,214 acres
Pollution (water, air, land)	Reduce erosion on 38 miles of stream channel
	Increase erosion on 3 miles of stream channel
	Reduce stream turbidity and improve irrigation water quality
	Reduce peak flood flows by 60-90 percent
	Increase sewage and solid waste
	Cause muddy water during construction
	Increase smoke, dust, and noise levels
Esthetic	Provide 600 to 900 acres of flat water scenery
	Annually expose 174 acres of shoreline trash and debris
	Provide less muddy water, more stable stream banks
	Change the "natural" scenic quality of 1,214 acres
	Change scenic quality on 9 miles of road relocation
	Create construction scars until revegetation is accomplished

[a] A summary of physical data for each reservoir is presented in Table 10.

Chalk Creek Upper (2A-24a)

More intensive evaluation of the impacts of the 1½ mile road relocation and the 82 acres of annually exposed shoreline on the scenic quality of the area is needed. The existing reservoir at the mouth of Chalk Creek filled with sediment the same year it was constructed and therefore the present sediment yield in Chalk Creek must be thoroughly investigated. Due to the proximity of this reservoir and facilities to Interstate 15, the provision of adequate sanitary and other facilities and the administration of these facilities could become a major problem.

Big Hollow (2A-25c)

The Forest Service does not support this reservoir as a program alternative because of adverse environmental impacts and difficulties in providing for and administering recreation at this site. Adequate access for recreationists to the site would require fairly high standard roads over steep, difficult, unstable topography. Administration of recreation at this site, because of its distance from other recreation sites, would be expensive. Provision for adequate sanitation and solid waste disposal at this dispersed site would also be a major problem. Environmental and stream stability problems originating from dewatering 6 miles of one fork of Corn Creek and then using 2 miles of another drainage to carry increased volumes of water is also a primary concern. Dewatering the one stream channel would have adverse affects on riparian vegetation, existing patterns of livestock use and fish and wildlife habitat. Adding a major increment of water during the irrigation season to an existing drainage could cause serious erosion problems in this drainage. This erosion potential, the possibility of additional sediment yield, and other factors need to be carefully evaluated.

Cottonwood (2A-25d)

The impacts of this reservoir upon approximately 2 miles of existing stream channel and fish habitat needs to be fully investigated. Also, provisions for adequate sanitation and solid waste disposal need to be re-evaluated under new requirements. Relocation of approximately one mile of existing road in Second Creek could cause environmental impacts related to the project which have not been fully evaluated.

Lower Three Creek (2B-1g)

The recreation benefit attributed to this reservoir should be evaluated in terms of the existing type of recreation use associated with free-flowing streams, scenic willow bottoms, camping, and sightseeing. Impacts of relocating 2 miles of Highway U-153 and power lines need to be fully analyzed. Provisions for adequate boating

facilities, sewage, solid waste disposal, and administration of recreation also need to be analyzed in view of existing requirements. A continuous flow of high quality water and reduced sediment could enhance fishing opportunities for 10 miles below the site.

Milk Ranch (2B-2a)

Existing access to this reservoir site is not adequate for the level of recreation use indicated. Environmental impacts of improving the existing access road as well as relocating one-half mile of road at the reservoir site should be fully analyzed. Recreational trade-offs in providing 23 acres of flat water recreation and 9 acres of annually exposed shoreline in place of the scenic free-flowing stream, fishing, and other recreational values inherent in the existing conditions at the site will need to be fully evaluated. Reduced sediment and a continuous flow of high quality water could enhance fishing opportunities for 4 miles below the site. Requirements for providing administration, sanitation, and solid waste disposal at this remote site needs to be carefully considered.

Little Creek (2B1-3a)

Environmental impacts associated with relocating one mile of road, providing adequate access, administration of recreation, adequate sewage and waste disposal should be fully considered. Further evaluation of the 16 acres of annually exposed shoreline trash and debris is needed.

Upper Pinto (2B2-1h)

Environmental impacts associated with adequate access, recreation administration, sanitation, and solid waste disposal should be fully considered.

Indian Rock (2B2-2f)

Further evaluation of the impacts of the one mile road relocation and the 25 acres of annually exposed shoreline on the scenic quality of the area is needed. Provisions for recreation administration, sanitation, and waste disposal should be carefully considered.

Chapter III

RELATED LAND RESOURCE DEVELOPMENT

This chapter identifies potential development and opportunity alternatives for water-related land resources. Sections included are Watershed Stabilization, Forest Wood Products, Rangeland Improvement, and Cropland Development. Watershed stabilization is needed to maintain land productivity by reducing erosion, and to decrease sediment and peak flood flows. Development of forest, range, and cropland resources will help to meet food and fiber needs in the basin and nation.

WATERSHED STABILIZATION

Measures to achieve watershed stabilization include improvement of vegetative cover and mechanical treatment such as contour trenching or furrowing. Roads are a frequent source of sediment; and stabilization measures or closing them to travel are alternatives.

Areas and roads selected for treatment were based upon the severity of the problem and the magnitude of downstream damages. The physical characteristics considered were: slope, aspect, soil depth and type, precipitation, and existing vegetation. Areas identified for treatment are within primary critical areas as defined in Appendix III.

Alternatives were selected to meet the need for solution of existing problems of erosion, flooding and sedimentation. They were evaluated using a with-without project approach. The quantities and values used in the analysis are presented in Appendix III.

RESOURCE CONSERVATION AND USE

There are 172,710 acres of "primary critical" watershed area in all ownerships and on all watersheds. Watershed stabilization opportunities for development by 1985 identified in the program include 14,351 acres on National Forests and 29,120 acres of public domain. Gully and stream stabilization opportunities include 47 miles on National Forests and 35 miles on public domain. Existing watershed protection land treatment includes 7,620 acres of area stabilization and three miles of gully stabilization on National Forests (Table 15).

Although considerable range seeding, brush control and other land treatment has been accomplished on private and state lands, none was identified specifically for watershed protection and management.

Critical area stabilization denotes areas suitable for mechanical treatment. This treatment includes contour trenching or furrowing, and vegetation improvement including control of less desirable species such as pinyon-juniper or sagebrush and revegetation. Disturbed area stabilization includes stabilization of roads and trails, mining dumps, or other areas. Gully and stream stabilization include measures such as drop structures, riprap, planting stream bank vegetation, protective fencing to reduce channel erosion, gully plugs, outsloping and revegetating gully sides, and other means.

Watershed stabilization measures reduce erosion, sediment and flood flows as indicated in Table 16. Quantitative flood data are not available for analysis, but a basin-wide reduction of 5 percent is estimated at the level of development indicated.

Development programs must be correlated with improved management for these direct benefits to be achieved. Achieving better management is the responsibility of land managing agencies under on-going programs and is, therefore, not included in the development program.

COST ANALYSIS

On National Forests, watersheds having a 0.9 to 1.0 or better B:C ratio include Chalk Creek, Beaver River, Coal Creek and Red Creek. The analysis brought out the following points as ways to maximize benefits at least cost: (1) Emphasize the program in watersheds having high response values - Chalk Creek, Beaver River and Coal Creek. (2) In other watersheds shift vegetation improvement to the range improvement program. (3) Additional refinement of programs to specific drainages will increase efficiency. Table 17 shows the costs of watershed stabilization.

ENVIRONMENTAL EVALUATION

This section flags some impacts that may or could take place. Further study and evaluation of the extent of impacts on the environment should be considered prior to installation of stabilization measures.

Opinions vary considerably on the magnitude, relevance, and type of impact of various developments.

Application of the projected watershed stabilization treatment by 1985 could change 41,540 acres of native vegetation, pinyon-juniper, and sagebrush to grassland; 1,931 acres of predominantly bare soil to grassland-browse; and 82 miles of eroding channels to stable streams. Construction could cause disturbances that would be temporary. Some wildlife habitat would be improved while other would be reduced. Additional environmental evaluation is given in Table 18.

TABLE 15.--Watershed stabilization on National Forests and public domain, Beaver River Basin

Watershed and treatment	Unit	Existing 1967	Development potential	Opportunities for development by 1985[a] Accelerated[b]
National Forests				
Chalk Creek (2A-24)				
Critical area stabilization	Acres	3,500	1,030	800
Disturbed area "	Acres	5	220	220
Gully & stream "	Miles	0	54	12
Corn Creek (2A-25)				
Critical area stabilization	Acres	680	14,140	2,720
Disturbed area "	Acres	2,625	140	140
Gully & stream "	Miles	3	25	8
Beaver (2B-1)				
Critical area stabilization	Acres	0	8,300	2,400
Distrubed area "	Acres	25	679	679
Gully & stream "	Miles	0	59	17
Wildcat (2B-2)				
Critical area stabilization	Acres	0	210	0
Disturbed area "	Acres	0	116	116
Gully & stream "	Miles	0	3	3
Cove Creek (2B-5)				
Critical area stabilization	Acres	0	1,100	0
Disturbed area "	Acres	0	282	0
Gully & stream "	Miles	0	4	0
Coal Creek (2B1-1)				
Critical area stabilization	Acres	169	850	0
Disturbed area "	Acres	10	116	116
Gully & stream "	Miles	0	8	2
Red Creek (2B1-3)				
Critical area stabilization	Acres	0	2,300	2,000
Disturbed area "	Acres	2	50	50
Gully & stream "	Miles	0	29	0
Pinto Creek (2B2-1)				
Critical area stabilization	Acres	0	3,240	1,800
Disturbed area "	Acres	2	680	210
Gully & stream "	Miles	0	47	3
Shoal Creek (2B2-2)				
Critical area stabilization	Acres	2	14,500	3,000
Disturbed area "	Acres	600	200	100
Gully & stream "	Miles	0	40	0
Total				
Critical area stabilization	Acres	4,351	45,670	12,720
Disturbed area "	Acres	3,269	2,483	1,631
Gully & stream "	Miles	3	269	47
Public Domain				
Vegetation improvement	Acres	(c)	(c)	28,820
Disturbed area stab.	Acres			300
Gully stabilization	Miles			35

[a] Going Program.
[b] In addition to going programs.
[c] Not evaluated.

TABLE 16.--Decreased annual erosion, sediment, and flood damages through watershed stabilization on National Forests and public domain, Beaver River Basin

Watershed	Damage	Unit	Existing (1967)	Development potential	Opportunities for development by 1985[a] Accelerated[b]
National Forests					
Chalk Creek (2A-24)	Erosion	Ac.Ft.	22.4	7.6	6.2
	Sediment	Ac.Ft.	18.8	6.4	5.2
	Flood	Dollars	7,600	2,510	2,050
Corn Creek (2A-25)	Erosion	Ac.Ft.	27.9	17.0	8.8
	Sediment	Ac.Ft.	8.5	5.0	2.7
	Flood	Dollars	980	600	310
Beaver (2B-1)	Erosion	Ac.Ft.	24.9	12.0	7.3
	Sediment	Ac.Ft.	11.6	6.0	3.4
	Flood	Dollars	3,520	2,000	1,030
Wildcat (2B-2)	Erosion	Ac.Ft.	72.0	1.1	0.4
	Sediment	Ac.Ft.	12.1	0.3	0.1
	Flood	Dollars	-	-	-
Cove Creek (2B-5)	Erosion	Ac.Ft.	(c)		
	Sediment	Ac.Ft.	-		
	Flood	Dollars	-		
Coal Creek (2B1-1)	Erosion	Ac.Ft.	143.9	6.7	0.8
	Sediment	Ac.Ft.	99.1	5.8	0.7
	Flood	Dollars	304,880	17,730	2,130
Red Creek (2B1-3)	Erosion	Ac.Ft.	23.9	6.3	5.5
	Sediment	Ac.Ft.	5.7	1.5	1.3
	Flood	Dollars	-	-	-
Pinto Creek (2B2-1)	Erosion	Ac.Ft.	50.5	6.2	3.2
	Sediment	Ac.Ft.	7.2	1.0	0.5
	Flood	Dollars	1,880	250	130
Shoal Creek (2B2-2)	Erosion	Ac.Ft.	165.9	18.0	3.8
	Sediment	Ac.Ft.	22.3	2.4	0.5
	Flood	Dollars	2,200	230	50
TOTAL	Erosion	Ac.Ft.	537.0	74.9	36.0
	Sediment	Ac.Ft.	186.9	28.4	14.4
	Flood	Dollars	321,060	23,320	5,700
Public Domain					
TOTAL	Erosion	Ac.Ft.	537	(c)	23.6
	Sediment	Ac.Ft.	186.9		8.2
	Flood	Dollars	321,060		1,410

[a]Going program.
[b]In addition to going program.
[c]Not evaluated.

TABLE 17.--Projected watershed stabilization costs, accelerated program, 1966-1985, Beaver River Basin

Watershed and treatment	Installation cost	Annual costs		
		Amortized Cost[a]	O & M	Total annual
	Dollars	Dollars	Dollars	Dollars
National Forests				
Chalk Creek (2A-24)				
Critical area stabilization	12,000	660	30	690
Disturbed area stabilization	22,000	1,220	60	1,280
Gully & stream stabilization	32,000	1,770	80	1,850
Corn Creek (2A-25)				
Critical area stabilization	56,300	3,110	140	3,250
Disturbed area stabilization	14,000	770	40	810
Gully & stream stabilization	26,000	1,440	60	1,500
Beaver (2B-1)				
Critical area stabilization	38,500	2,130	100	2,230
Disturbed area stabilization	67,900	3,750	170	3,920
Gully & stream stabilization	64,000	3,540	160	3,700
Wildcat (2B-2)				
Critical area stabilization	-	-	-	-
Disturbed area stabilization	11,600	640	30	670
Gully & stream stabilization	6,000	330	20	350
Coal Creek (2B1-1)				
Critical area stabilization	-	-	-	-
Disturbed area stabilization	11,600	640	30	670
Gully & stream stabilization	8,000	440	20	460
Red Creek (2B1-3)				
Critical area stabilization	30,000	1,660	80	1,740
Disturbed area stabilization	5,000	280	10	290
Gully & stream stabilization	-	-	-	-
Pinto Creek (2B2-1)				
Critical area stabilization	27,000	1,490	70	1,560
Disturbed area stabilization	21,000	1,160	50	1,210
Gully & stream stabilization	10,000	550	20	570
Shoal Creek (2B2-2)				
Critical area stabilization	45,000	2,490	110	2,600
Disturbed area stabilization	10,000	550	20	570
Gully & stream stabilization	-	-	-	-
BASIN TOTAL				
Critical area stabilization	208,800	11,540	530	12,070
Disturbed area stabilization	163,100	9,010	410	9,420
Gully & stream stabilization	146,000	8,070	360	8,430
Public Domain				
BASIN TOTAL				
Critical area stabilization	432,300	23,890	1,080	24,970
Disturbed area stabilization	30,000	1,660	80	1,740
Gully & stream stabilization	70,000	3,870	180	4,050

[a] Amortized for 100 years @ 5-1/2 percent interest.

TABLE 18.--Environmental impacts for future evaluation, watershed stabilization, Beaver River Basin

Aspect	Effect or impact
Ecological	Change composition of plant species on 41,540 acres
	Increase vegetation on 1,931 acres
	Change various wildlife habitat on 43,471 acres
	Improve habitat for big game and upland game
	Improve 26 miles of fish habitat
	Stabilize 26 miles of endemic stream bank species
	Disturb wildlife during construction
	Change susceptability to insect and disease
	Change predator-prey relationships
	Increase density of vegetation on 43,471 acres
Pollution	Reduce flood flows and improve water quality
	Reduce erosion on 43,471 acres
	Reduce erosion on 82 miles of streams and gullies
	Reduce soil pollution by about 14 acre-feet annually
	Increase smoke, dust, and noise level during construction
	Increase noise and disturbance if open areas are utilized by mechanized equipment
	Decrease noise and disturbance areas where roads and trails are closed
	Change noise level with vegetation change
Esthetic	Provide 82 miles of more stable streams and gullies
	Change the "natural" scenic quality on 43,471 acres
	Create construction scars until vegetation is established
	Reduce muddy water and erosion scars
	Restore a "natural" scene where roads and trails are closed
	Change quantity and diversity of biotic organisms
	Change resource husbandry
	Provide vegetation of 1,931 acres of bare land
	Create major soil disturbance on 720 acres by trenching and furrowing

FOREST PRODUCTS

Existing levels of resource use are described in Appendix II (Resource Use and Management). This includes the harvest of 1,560,000 board feet of sawtimber, 15,570 posts; 1,760 poles; 100 cords of firewood; 2,750 Christmas trees; 19 ornamental trees, and 1,300 pounds of pinyon nuts annually.

The total basin resource includes about 110,400 acres growing 663 million board feet of sawtimber and 48,200 acres growing 22 million board feet of poles. Much of these resources are presently economically marginal or uneconomical for use. There are potentials to improve this resource through re-forestation of 6,820 acres and to improve the quality of timber through thinning and pruning on 1,030 acres. Increase harvesting of most species is limited because of conflicts with other forest uses. Aspen could be more fully utilized if better markets were available.

There is an opportunity to work with private landowners to demonstrate the compatibility of producing forest crops along with other uses of these lands. Periodic harvests in summer home areas can maintain a healthy, vigorous stand of trees and can alleviate many problems associated with over-maturity. Also planting of marginal farm lands for Christmas tree production is another development potential.

The greatest potential is related to the 1,311,460 acres of pinyon-juniper. This is estimated to be about 222 million cubic feet of wood fiber. Knowledge of the characteristics of the best sites to grow pinyon-juniper is limited. Obtaining this knowledge through research and then applying it to management of pinyon-juniper for various products on the most productive sites is a potential opportunity. Development of additional products from these trees, pruning, and other potentials to utilize or improve the resource are present. Additional technology and markets for forest products will not be developed in the next 10 to 15 years. Therefore, opportunities for development related to the products were not identified.

RANGELAND

Rangelands include areas of native vegetation or introduced forage species grazed by domestic livestock or big game. Cultivated areas and irrigated pasture were not considered as rangeland. The acres of rangeland contained within the Basin were identified during the land use inventory phase. This acreage was then adjusted to reflect a base of over 4 million acres which is suitable for sustained livestock grazing. This includes about 2.8 million acres of public domain rangeland which in 1967 produced 219,240 AUMs of grazing for cattle and sheep or 56 percent of the total rangeland grazing. In addition, 201,490 acres of National Forests provided 36,030 AUMs (9 percent); 839,000 acres of private lands provided 115,880 AUMs (29 percent); and 349,010 acres of state lands provided 22,210 AUMs (6 percent). The requirements for range forage by 1980 is projected to increase by approximately 46,500 AUMs. Sufficient development potential is available to meet this increase in demand due to large acreages of underdeveloped rangeland. Additional information on present use is given in Appendix II, and on projected demands in Appendix IV.

Several data sources were employed in determining treatment potential on these lands, and also determining the increase in grazing animal unit months attributed to development alternatives. The Conservation Needs Inventory provided the basic data for private and state land development while opportunities projected on National Forests and public domain lands came from district rangers and managers generally familiar with the area.

Opportunities for development were identified and evaluated for forage improvement and range facilities. The primary goal of range improvement is to provide additional grazing opportunities for additional livestock. Other related benefits such as increased wildlife grazing opportunities and reduced erosion, sedimentation, and flooding were not evaluated.

Areas identified for forage improvement include those that have climatic conditions and soil characteristics favorable to produce sufficient forage to justify improvement costs. Forage improvement requires treatment such as brush control, seeding, and pinyon-juniper chaining; and associated livestock management and control facilities such as water developments and fences to insure the successful establishment and utilization of the improved forage.

Areas identified for range facilities only, include those on private and state lands which were not previously identified with forage improvement, and which do not already have adequate facilities.

Opportunities for development by 1985 for increases in livestock grazing are based on a continuation of range facilities and forage improvement programs at current or accelerated levels of accomplishment, exclusive of improved range management. Improved management would permit additional grazing beyond that shown.

RESOURCE CONSERVATION AND USE

On public lands, range improvement opportunities were selected with consideration to other resource uses and to maintain a high level of productivity on a sustained yield basis. Opportunities were also selected to provide a maximum economic return over a long term period and for this reason, economic goals and resource conservation are met by one program. On public lands, opportunities and development potentials for range facilities were identified and evaluated only in connection with forage improvement. Existing improvements, opportunities for development by 1985, and potential beyond 1985 are shown in Table 19 for National Forests, and Table 20 for public domain. Approximately 108,000 acres were identified for both going and accelerated programs as having opportunities for forage improvement on public lands by 1985. This forage improvement with associated facilities would increase grazing production 9,140 AUMs by 1985 on public lands (Table 21).

Range improvements were identified on all private rangeland and on state lands leased for grazing. Opportunities for development were identified and evaluated for (1) forage improvement including the necessary mechanical treatment and associated range facilities, and (2) range facilities on areas that do not require extensive forage improvement, and which do not already have adequate facilities. Existing improvements, opportunities for development by 1985, and potential beyond 1985 are shown in Table 22 for private land and Table 23 for state lands. For both going and accelerated programs, approximately 51,880 acres were identified as having opportunities for forage improvement on private and state lands by 1985. With the application of both going and accelerated programs there are opportunities for increasing grazing over 46,600 AUMs by 1985 through forage improvement and range facilities on private land (Table 24) and over 8,600 on state land (Table 25).

Not evaluated, were the opportunities for increased grazing production (AUM) resulting from improved range management which could occur with or without range control facilities and forage improvements.

TABLE 19.--Range facilities and forage improvement on National Forests, Beaver River Basin

Subbasin	Treatment[a]	Unit	Existing 1965[b]	Development potential[c]	Opportunities for development by 1985[c]		
					Going[b]	Accelerated	Total
Fillmore (2A)	Water developments	No.	62	57	15	42	57
	Fences	Miles	101	35	9	16	25
	Forage improvement	Acres	866	9,720	2,488	792	3,280
Beaver-Milford (2B)	Water developments	No.	34	40	13	37	50
	Fences	Miles	97	88	8	46	54
	Forage improvement	Acres	4,368	15,700	4,032	5,668	9,700
Cedar-Parowan (2B1)	Water developments	No.	25	24	8	16	24
	Fences	Miles	52	18	5	3	8
	Forage improvement	Acres	1,400	2,100	400	0	400
Escalante Desert (2B2)	Water developments	No.	129	75	16	59	75
	Fences	Miles	133	104	15	0	15
	Forage improvement	Acres	10,581	35,880	8,274	8,626	16,900
Basin Total	Water developments	No.	250	206	52	154	206
	Fences	Miles	383	245	37	65	102
	Forage improvement	Acres	17,215	63,400	15,194	15,086	30,280

[a]Water developments include troughs, wells, reservoirs, and pipelines; forage improvement includes sagebrush control, pinyon-juniper chaining, plowing and seeding.
[b]Additional information in Appendix II.
[c]In addition to existing improvements in 1965.

TABLE 20.--Range facilities and forage improvement on public domain, Beaver River Basin

Subbasin	Treatment[a]	Unit	Existing (1970)	Opportunities for development by 1985[c] Going[b]
Fillmore[d] (2A)	Water developments	No.	27	35
	Fences	Miles	140	75
	Forage improvement	Acres	21,900	28,600
Beaver-Milford (2B)	Water developments	No.	74	70
	Fences	Miles	356	144
	Forage improvement	Acres	39,000	36,000
Cedar-Parowan (2B1)	Water developments	No.	24	10
	Fences	Miles	254	58
	Forage improvement	Acres	23,320	6,180
Escalante Desert (2B2)	Water developments	No.	39	28
	Fences	Miles	437	116
	Forage improvement	Acres	5,950	6,550
Sevier Lake (2)	Water developments	No.	76	25
	Fences	Miles	95	45
	Forage improvement	Acres	6,700	300
Basin Total	Water developments	No.	240	168
	Fences	Miles	1,282	438
	Forage improvement	Acres	96,870	77,630

[a]Water developments include troughs, wells, reservoirs, pipelines and spring developments; forage improvement includes pinyon-juniper chaining, brush control and seeding.
[b]Additional information in Appendix II. In addition to existing improvements in 1970.
[c]Development potential and accelerated programs were not evaluated.
[d]Includes Tintic Watershed.

TABLE 21.--Increased grazing (AUM) resulting from range facilities and forage improvement on National Forest and public domain, Beaver River Basin

Subbasin	Ownership or Administration	Existing grazing (1967)[a]	Opportunities for development by 1985[b]		
			Going[a]	Accelerated	Total
Fillmore (2A)	National Forest	9,680	384	122	505
	Public domain	13,380	1,287	c	1,287
Beaver-Milford (2B)	National Forest	8,420	911	1,281	2,192
	Public domain	103,850	2,988	c	2,988
Cedar-Parowan (2B1)	National Forest	5,320	42	0	42
	Public domain	18,410	235	c	235
Escalante Desert (2B2)	National Forest	12,610	803	837	1,640
	Public domain	28,100	250	c	250
Sevier Lake (2)	National Forest	0	0	0	0
	Public domain	55,500	0	c	0
Basin Total	National Forest	36,030	2,140	2,240	4,380
	Public domain	219,240	4,760	c	4,760

[a]Additional information in Appendix II.
[b]In addition to existing grazing in 1967. Development was not evaluated.
[c]Not evaluated.

TABLE 22.-- Range facilities and forage improvement on private lands, Beaver River Basin

Subbasin	Development or treatment[a]	Unit	Existing (1965)[b]	Development potential[c]	Opportunity for development by 1985[c]		
					Going[b]	Accelerated	Total
Fillmore (2A)	Water development	No.	210	780	264	200	464
	Fencing	Mile	165	235	79	60	139
	Forage improvement	Acre	735	890	890	0	890
Beaver-Milford (2B)	Water Development	No.	195	950	238	143	381
	Fencing	Mile	125	285	71	43	114
	Forage improvement	Acre	18,480	38,290	4,200	7,100	11,300
Cedar-Parowan (2B1)	Water development	No.	240	1,370	255	167	422
	Fencing	Mile	190	410	76	50	126
	Forage improvement	Acre	14,060	27,160	5,160	6,000	11,160
Escalante Desert (2B2)	Water development	No.	340	2,590	380	258	638
	Fencing	Mile	330	775	228	154	382
	Forage improvement	Acre	26,580	51,620	9,620	11,000	20,620
Sevier Lake (2)	Water development	No.	20	100	23	10	33
	Fencing	Mile	20	30	7	3	10
	Forage improvement	Acre	75	120	120	0	120
Basin Total	Water development	No.	1,005	5,790	1,160	778	1,938
	Fencing	Mile	830	1,735	461	310	771
	Forage improvement	Acre	59,930	118,080	19,990	24,100	44,090

[a]Water development includes troughs, wells, ponds, pipelines, and spring developments; forage improvement includes brush control, seeding, and pinyon-juniper chaining.
[b]Additional information in Appendix II.
[c]In addition to existing treatment in 1965.

TABLE 23.--Range facilities and forage improvement on state land, Beaver River Basin

Subbasin	Treatment[a]	Unit	Existing 1965	Development potential[b]	Opportunities for development by 1985[c] Total
Fillmore (2A)	Water developments	No.	40	150	49
	Fences	Miles	20	45	14
	Forage improvement	Acres	350	180	180
Beaver-Milford (2B)	Water developments	No.	.110	550	174
	Fences	Miles	40	160	52
	Forage improvement	Acres	1,100	12,120	4,000
Cedar-Parowan (2B1)	Water developments	No.	40	210	64
	Fences	Miles	30	60	19
	Forage improvement	Acres	400	2,490	820
Escalante Desert (2B2)	Water developments	No.	120	670	211
	Fences	Miles	60	200	63
	Forage improvement	Acres	650	7,940	2,450
Sevier Lake (2)	Water developments	No.	80	840	133
	Fences	Miles	20	250	40
	Forage improvement	Acres	200	960	340
Basin Total	Water developments	No.	390	2,420	631
	Fences	Miles	170	715	188
	Forage improvement	Acres	2,700	23,690	7,790

[a]Water developments include troughs, wells, ponds, pipelines, and spring developments; forage improvement includes brush control, seeding, and pinyon-juniper chaining.
[b]In addition to existing treatment in 1965.
[c]Includes going and accelerated programs.

TABLE 24.--Increased grazing (AUM) resulting from range facilities and forage improvement on private land, Beaver River Basin

Subbasin	Development or treatment	Existing (1967)	Development potential[a]	Opportunity for development by 1985[a]		
				Going	Accelerated	Total
Fillmore (2A)	Forage improvement	-	277	277	0	277
	Range facilities[b]	-	11,154	3,697	2,880	6,577
	Total	17,390	11,431	3,974	2,880	6,854
Beaver-Milford (2B)	Forage improvement	-	8,144	1,488	2,756	4,244
	Range facilities[b]	-	11,625	3,045	1,253	4,298
	Total	27,620	19,769	4,533	4,009	8,542
Cedar-Parowan (2B1)	Forage improvement	-	5,790	1,830	2,160	3,990
	Range facilities[b]	-	16,976	2,921	1,610	4,531
	Total	24,120	22,766	4,751	3,770	8,521
Escalante Desert (2B2)	Forage improvement	-	10,756	3,343	3,883	7,226
	Range facilities[b]	-	32,204	9,387	5,836	15,223
	Total	45,710	42,960	12,730	9,719	22,449
Sevier Lake (2)	Forage improvement	-	24	24	0	24
	Range facilities[b]	-	705	151	71	222
	Total	1,040	729	175	71	246
Basin total	Forage improvement	-	24,991	6,962	8,799	15,761
	Range facilities[b]	-	72,664	19,201	11,650	30,851
	Total	115,880	97,655	26,163	20,449	46,612

a In addition to existing grazing in 1967.
b Includes fencing and water developments.

TABLE 25.--Increased grazing (AUM) resulting from range facilities and forage improvement on state land, Beaver River Basin

Subbasin	Treatment	Existing grazing (1967)[a]	Development potential[b]	Opportunities for development by 1985[c] Total
Fillmore (2A)	Forage improvement	-	45	45
	Range facilities[d]	-	2,004	630
	Total	1,920	2,049	675
Beaver-Milford (2B)	Forage improvement	-	3,119	1,027
	Range facilities[d]	-	6,091	1,952
	Total	8,200	9,210	2,979
Cedar-Parowan (2B1)	Forage improvement	-	763	249
	Range facilities[d]	-	2,377	724
	Total	6,260	3,140	973
Escalante Desert (2B2)	Forage improvement	-	2,405	740
	Range facilities[d]	-	7,623	2,403
	Total	2,330	10,028	3,143
Sevier Lake (2)	Forage improvement	-	136	48
	Range facilities[d]	-	5,007	787
	Total	3,500	5,143	835
Basin Total	Forage improvement	-	6,468	2,109
	Range facilities[d]	-	23,102	6,496
	Total	22,210	29,570	8,605

[a]Estimated production from all state rangeland including those acres treated.
[b]In addition to existing grazing in 1967.
[c]Includes going and accelerated programs.
[d]Includes fencing and water developments.

COST ANALYSIS

Evaluations of range improvements were based on the additional grazing resulting from increased forage. Common values for the identified increases were used even though permittee and leasee charges are generally quite different. Installation costs were amortized for 50 years at 5½ percent interest rate.

Total installation costs of $390,890 and annual costs of $31,710 for range improvement programs on National Forests were projected (Table 26). Total installation costs of over 2.6 million dollars and annual costs over $206,000 on private land for range facilities and forage improvement programs were projected for both going and accelerated programs (Tables 27 and 28). Total installation costs of over $602,000 and annual costs of $42,010 for range facilities and forage programs on state lands were projected for both going and accelerated programs (Table 29).

ENVIRONMENTAL EVALUATION

This section identifies some impacts that may or could take place. Further study and evaluation of the extent of impacts on the environment should be considered prior to range improvements, particularly those involving forage improvements. Opinions vary considerably on the magnitude, relevance, and type of impact of various developments.

The effects of proposed range improvement programs are generally favorable, but there are some adverse effects. Some types of wildlife habitat will be increased while other types will be decreased. Grass forage will generally increase and vegetation composition will change. The environmental impact of forage improvement on 108,000 acres of public lands and 51,880 acres of private and state lands including related fences and water developments, is summarized in Table 30. The environmental impacts of range facilities only on private and state lands were not evaluated, but would probably be similar to those shown for forage improvement but with less magnitude.

TABLE 26.--Projected range facilities and forage improvement costs for going and accelerated programs on National Forests, 1965-1985, Beaver River Basin

Item	Treatment	Unit	Amount	Installation cost	Amortized cost[a]	Replacement and O&M	Total annual cost
				----------Dollars----------			
Going program	Water development	Each	52	15,600			
	Fences	Mile	37	37,000			
	Forage improvement	Acre	15,194	113,950			
	Total			166,550	9,830	3,980	13,810
Accelerated program	Water development	Each	154	46,200			
	Fences	Mile	65	65,000			
	Forage improvement	Acre	15,086	113,140			
	Total			224,340	13,250	4,650	17,900

a 50 years @ 5½ percent interest

TABLE 27.--Projected range facilities and forage improvement costs for going program on private land, 1965-1985, Beaver River Basin

Subbasin	Development or treatment	Unit	Amount	Installation cost	Annual costs		
					Amortized[a]	Replacement and O&M	Total
				Dollars			
Fillmore (2A)	Water developments	No.	264	118,800	7,010	2,380	9,390
	Fences	Mile	79	79,000	4,670	2,150	6,820
	Forage improvement	Acre	890	9,720	570	50	620
	Total			207,520	12,250	4,580	16,830
Beaver-Milford (2B)	Water developments	No.	238	107,100	6,320	2,140	8,460
	Fences	Mile	71	71,000	4,200	1,930	6,130
	Forage improvement	Acre	4,200	59,640	3,520	300	3,820
	Total			237,740	14,040	4,370	18,410
Cedar-Parowan (2B1)	Water developments	No.	255	114,750	6,780	2,300	9,080
	Fences	Mile	76	76,000	4,490	2,070	6,560
	Forage improvement	Acre	5,160	88,420	5,220	440	5,660
	Total			279,170	16,490	4,810	21,300
Escalante Desert (2B2)	Water developments	No.	380	342,000	20,190	6,840	27,030
	Fences	Mile	228	228,000	13,480	6,210	19,690
	Forage improvement	Acre	9,620	164,790	9,730	820	10,550
	Total			734,790	43,400	13,870	57,270
Sevier Lake (2)	Water developments	No.	23	10,350	610	210	820
	Fences	Mile	7	7,000	410	190	600
	Forage improvement	Acre	120	1,480	90	10	100
	Total			18,830	1,110	410	1,520
Basin total	Water developments	No.	1,160	693,000	40,910	13,870	54,780
	Fences	Mile	461	461,000	27,250	12,550	39,800
	Forage improvement	Acre	19,990	324,050	19,130	1,620	20,750
	Total			1,478,050	87,290	28,040	115,330

a Amortized @ 5½ percent interest for 50 years.

TABLE 28.--Projected range facilities and forage improvement costs for accelerated program on private land, 1965-1985, Beaver River Basin

Subbasin	Development or treatment	Unit	Amount	Installation cost	Annual Costs		
					Amortized[a]	Replacement and O&M	Total
Fillmore (2A)	Water developments	No.	200	90,000	5,310	1,800	7,110
	Fences	Mile	60	60,000	3,550	1,640	5,190
	Forage improvement	Acre	0	0	0	0	0
	Total			150,000	8,860	3,440	12,300
Beaver-Milford	Water developments	No.	143	64,350	3,800	1,290	5,090
	Fences	Mile	43	43,000	2,540	1,170	3,710
	Forage improvement	Acre	7,100	126,450	7,470	630	8,100
	Total			233,800	13,810	3,090	16,900
Cedar-Parowan (2B1)	Water developments	No.	167	75,150	4,440	1,500	5,940
	Fences	Mile	50	50,000	2,960	1,360	4,320
	Forage improvement	Acre	6,000	108,000	6,380	540	6,920
	Total			233,150	13,780	3,400	17,180
Escalante Desert (2B2)	Water developments	No.	258	231,750	13,680	4,640	18,320
	Fences	Mile	154	154,000	9,100	4,200	13,300
	Forage improvement	Acre	11,000	198,000	11,690	990	12,680
	Total			583,750	34,470	9,830	44,300
Sevier Lake (2)	Water developments	No.	10	4,500	270	90	360
	Fences	Mile	3	3,000	180	80	260
	Forage improvement	Acre	0	0	0	0	0
	Total			7,500	450	170	620
Basin Total	Water developments	No.	778	465,750	27,500	9,320	36,820
	Fences	Mile	310	310,000	18,330	8,450	26,780
	Forage improvement	Acre	24,100	432,450	25,540	2,160	27,700
	Total			1,208,200	71,370	19,930	91,300

a Amortized @ 5½ percent interest for 50 years.

TABLE 29.--Projected range facilities and forage improvement costs for going and accelerated programs on state land, 1965-1985, Beaver River Basin

Subbasin	Treatment	Unit	Amount	Annual costs			
				Installation cost	Amortized cost[a]	Replacement & O&M	Total
				----------Dollars----------			
Fillmore (2A)	Water developments	No.	49	22,050	1,290	200	1,490
	Fences	Miles	14	14,000	830	500	1,330
	Forage improvement	Acres	180	1,870	110	10	120
	Total			37,920	2,130	710	2,940
Beaver-Milford (2B)	Water developments	No.	174	78,300	4,580	500	5,080
	Fences	Miles	52	52,000	3,080	1,000	4,080
	Forage improvement	Acres	4,000	68,060	4,010	340	4,350
	Total			198,360	11,670	1,840	13,510
Cedar-Parowan (2B1)	Water developments	No.	64	28,800	1,720	150	1,870
	Fences	Miles	19	19,000	1,120	400	1,520
	Forage improvement	Acres	820	14,080	820	80	900
	Total			61,880	3,660	630	4,290
Escalante Desert (2B)	Water developments	No.	211	94,950	5,580	600	6,180
	Fences	Miles	63	63,000	3,720	1,200	4,920
	Forage improvement	Acres	2,450	43,020	2,520	250	2,770
	Total			200,970	11,820	2,050	13,870
Sevier Lake (2)	Water developments	No.	133	59,850	3,530	380	3,910
	Fences	Miles	40	40,000	2,360	900	3,260
	Forage improvement	Acres	340	3,650	210	20	230
	Total			103,500	6,100	1,300	7,400
Basin Total	Water developments	No.	631	283,950	16,700	1,830	18,530
	Fences	Miles	188	188,000	11,110	4,000	15,110
	Forage improvement	Acres	7,790	130,680	7,670	700	8,370
	Total			602,630	35,480	6,530	42,010

a Amortized 50 years @ 5½ percent interest.

TABLE 30.--Environmental impacts for future evaluation, forage improvement, Beaver River Basin

Aspect	Effect or impact
Ecological	Change composition of plant species on 159,880 acres
	Change various wildlife habitat on 159,880 acres
	Improve habitat for big game
	Change susceptibility to insect and disease
	Change wildlife relationships
	Disturb wildlife during installation of improvements
	Change snow accumulation and time of melting
	Change soil moisture and other characteristics
	Provide 430 additional water sources for wildlife
	Restrict wildlife movement with 600 miles of fence
Pollution	Change livestock use of streams
	Reduce erosion on 159,880 acres
	Reduce flood flows and sedimentation
	Increase smoke, dust, and noise level during installation
	Increase noise and disturbance if equipment utilizes open areas
	Change noise level with vegetation change
	Increase livestock odor in areas of concentration
Esthetic	Change the "natural" scenic quality on 159,880 acres
	Create construction scars and/or debris
	Change resource husbandry
	Change quantity and diversity of biotic organisms
	Increase livestock and excrement
	Reduce unrestricted open space with 600 miles of fence

CROPLAND

There are 1,092,100 acres of arable land on which there is a reasonable expectancy of permanent profitable production of adapted crops under irrigation. Of this amount, 115,220 acres are presently irrigated cropland, 89,390 acres are non-irrigated cropland, and 32,130 acres are used for various non-cropland uses, including roads, railroads, towns, farmsteads and reservoirs. The remainder of the arable land is used primarily for grazing. The arable lands occur mainly in large valleys where topography is generally smooth and nearly level to gently sloping.

In addition, there are 701,000 acres of salt and alkali affected lands which are presently unsuited for irrigation. Some of this land may be suitable for irrigation use if drained and the salt and alkali removed. Some of the lands could be reclaimed readily by the installation of drains and leaching, others would require intensive treatment. These lands lie mainly on valley floors and are closely associated with the remnants of Lake Bonneville.

The development of the arable land resource potential is dependent upon water development. Importation of water will be needed since the local water resource is sufficient only for the needs of presently irrigated cropland. The irrigable land available for potential development is tabulated in Table 31 and shown on the map following page 48.

Potential dry cropland will probably be limited to the present acreage in the future, even though the Basin contains many more acres of arable land capable of continued crop production if water could be made available. Scant annual precipitation has largely suppressed grain yields to the point where continued production is questionable.

The development of all or part of the 944,750 acres of the potential irrigable land to irrigated cropland would have a substantial effect economically and environmentally. Such a development could improve the economic stability, enhance job security, contribute to local, regional and national security, provide additional net income from induced activities, increase the number and type of jobs available, and make use of unemployed resources. The environmental characteristics of clear air, clear skies, unmarred scenery, open spaces, and solitude would be affected. Environmental impacts from cropland development for future evaluation include: (1) change various wildlife habitat and predator-prey relationships, (2) change the composition and diversity of plant species, (3) restrict wildlife movement, (4) increase noise, dust, and pollution from sewage and solid wastes, (5) modify the present scenic landscape, (6) change susceptibility to insect and disease, (7) change quantity and diversity of biotic organisms, and (8) create major soil disturbance.

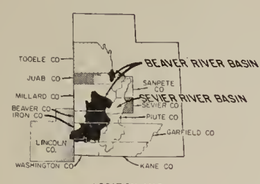
TABLE 31.--Potential irrigable land, Beaver River Basin, 1965

Subbasin		Available land resource[a]		Present use (1965)[d]			Potential irrigable land[f]
		Arable[b]	Salt and alkali effected[c]	Irrigated cropland	Non-irrigated cropland	Misc.[e]	
		Acres					
2	Sevier	167,700	323,600	110	0	70	167,520
2A	Fillmore	86,100	36,200	29,200	41,430	7,960	48,940
2B	Beaver-Milford	390,600	121,000	32,550	6,480	6,540	351,510
2B1	Cedar-Parowan	147,000	36,900	24,810	22,320	11,010	111,180
2B2	Escalante Desert	300,700	183,300	28,500	9,660	6,550	265,600
	Basin total	1,092,100	701,000	115,220	80,390	32,130	944,750

[a]Source: "Arable Land Resources of Utah", Utah Resources Series 42, 2/68.
[b]Presently suitable for irrigation and includes present cropland and miscellaneous land use.
[c]Presently unsuited for irrigation.
[d]Source: "Present and Projected Resource Use and Management" Appendix II - Beaver River Basin.
[e]Includes towns, farmsteads, roads, urban, reservoirs, etc.
[f]Arable land minus present irrigated cropland and miscellaneous use.

ARABLE LAND
NORTH PORTION
BEAVER RIVER BASIN
UTAH-NEVADA
JULY 1972

LOCATION MAP



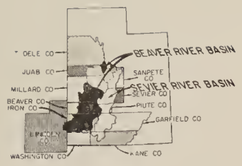
LOCATION MAP OF SUB-BASINS

LEGEND

- Arable
- Salt Alkali
- Irrigated
- Non-Irrigated

Source: Arable and Salt Alkali: — Utah Resources Series 42, February, 1968.

SCALE IN MILES 5 0 5 10



LOCATION MAP

LOCATION MAP OF SUB-BASINS

ZZ

LEGEND

- Arable
- Salt Alkali
- Irrigated
- Non-Irrigated

Source Arable and Salt Alkali: — Utah Resources Series 42, February, 1968.

ARABLE LAND

SOUTH PORTION

BEAVER RIVER BASIN

UTAH - NEVADA

JULY 1972

5 0 5 10

SCALE IN MILES

Chapter IV

OUTDOOR RECREATIONAL DEVELOPMENT

This chapter identifies outdoor recreational development potential, and opportunities for development which could be realized within the next 10-15 year period. Categories considered were big game habitat improvement, fish habitat improvement, and outdoor recreational facilities. Total outdoor recreation in 1969 was estimated at 502,000 visitor-days. Projected recreation demand for 1980 is 747,000 visitor-days. Additional information on present use and projected demands is given in Appendix II. Sufficient development potential to meet this demand is available due to the large numbers of undeveloped attractions and additional opportunities for outdoor recreation.

BIG GAME HABITAT IMPROVEMENT

The entire Beaver River Basin provides space for big game. Not all of the area can be categorized as habitat because of specific non-competitive uses that occupy many areas. The Utah Division of Wildlife Resources has separated the Basin into deer herd units. By definition the units are self complete, providing forage for migrating deer herds throughout the year. The area designated for elk and antelope overlap the deer herd units but are more restrictive relating more to the needs of the respective species.

Developments were largely identified for deer because of its predominance. Competing uses of land used for elk and antelope habitat generally limited identifying significant development for them.

Many acres of pinyon-juniper have been treated and browse species planted. Much of this acreage is shown in the forage improvement category. It is difficult to separate the two purposes of this activity but it is estimated that about 12,000 acres have been treated primarily for big game habitat improvement.

Opportunities to improve deer habitat were investigated on public domain and National Forest lands. By 1985 there is an opportunity to improve 19,350 acres of deer habitat on National Forests and 18,000 acres on public domain which could provide 16,740 hunter days. An additional 5,200 acres were identified as development potential on National Forests beyond 1985. Part of the improvement opportunities may be achieved by continuation of going programs but some acceleration will be needed to achieve the entire opportunities identified by 1985. Development potential and opportunities for development for big game habitat improvement are given in Table 32.

A cost analysis of the accelerated program (8,000 acres on National Forests and 18,000 acres on public domain) was made. Total installation costs were estimated at $508,900 and annual costs at $41,120.

Environmental impacts of big game habitat improvement were not evaluated in detail. Effects would be similar to those listed under "Range Improvement" (Table 30). Generally this development would (1) increase wildlife population including deer and mourning doves, (2) reduce erosion, (3) modify the pinyon-juniper ecology to more open brushland, and (4) modify the landscape through removal of pinyon-juniper and installation of fences and watering facilities.

TABLE 32.--Big game habitat improvement by browse planting and pinyon-juniper treatment on National Forest and public domain, Beaver River Basin

Watershed	Existing 1965[a]	Development potential	Opportunities for development by 1985		
			Going[a]	Accelerated	Total
	----------	----------	Acres	----------	----------
National Forests					
Chalk Creek (2A-24)	b	80	b	b	b
Corn Creek (2A-25)	b	3,900	1,600	600	2,200
Cove Creek (2B-5)	1,600	3,500	1,200	800	2,000
Beaver (2B-1)	b	2,800	280	600	880
Pinto-Shoal Creek (2B2-1) & (2B2-2)	10,580	14,270	8,270	6,000	14,270
Public Domain					
Minersville (2B-3)	b	10,000	b	10,000	10,000
Other areas	b	8,000	b	8,000	8,000

a Duplicates acreage indicated in forage improvement program.
b Not evaluated.

FISH HABITAT IMPROVEMENT

The Basin contains only a few streams that flow throughout the year capable of maintaining a catchable supply of fish. Some streams must be planted regularly to permit any fishing activity. The Utah State Division of Wildlife Resources has purchased water rights to permit conservation pools in LaBaron Reservoir, Minersville Reservoir and Upper Enterprise Reservoir. Anderson Meadows Reservoir is now a constant level fishing lake. Other existing improvement is a secondary result of watershed stabilization which has reduced the erosion and sediment load of streams and lakes.

Development potential for fish habitat improvement on National Forests that were identified include streamflow stabilization, reservoir stabilization, streambank protection, and pool-riffle improvement (Table 33). Opportunities associated with potential reservoirs are discussed in the section under "Reservoirs" in this appendix.

TABLE 33.--Fish habitat improvement on National Forests, Beaver River Basin

Watershed	Improvement	Unit	Development potential	Opportunities for development by 1985[a] Total
Corn Creek (2A-25)	Streambank protection	Miles	5	0
	Pool-riffle improvement	Miles	11.3	0
Wildcat Creek (2B-2)	Streamflow stabilization	Miles	9	0
	Pool-riffle improvement	Miles	2.5	0
	Reservoir stabilization	Acres	26	4
Beaver (2B-1)	Streamflow stabilization	Miles	7	0
	Streambank protection	Miles	23	0
	Reservoir stabilization and/or enlargement	Acres	17.5	13.5
Red Creek (2B1-3)	Streamflow stabilization	Miles	3	0
Basin total	Streamflow stabilization	Miles	19	0
	Streambank protection	Miles	28	0
	Pool-riffle improvement	Miles	14	0
	Reservoir stabilization	Acres	43	17.5

[a] Includes going and accelerated programs.

OUTDOOR RECREATION FACILITIES

The proximity of the Beaver River Basin to national parks and monuments, outstanding scenic and geologic vistas, significant historical and archeological sites, and major transportation facilities including highways I-15 and I-70 combine to create opportunities for recreation enhancement and development.

RESOURCE CONSERVATION AND USE

Development potentials identified include 36 campgrounds and picnic areas, 3 parks and rest stops, 7 points of interest, 5 observation and interpretive sites, 7 summer home residence sites, 2 lodge and resort sites, 2 winter sports areas, 2 water sports areas, 1 public swimming pool, and 2 golf courses. A partial listing of existing and potential outdoor recreation facilities irrespective of land ownership and administration is shown in Table 34 and on the recreation development map following page 56. Existing recreation developments were tabulated by watershed, administering authority, and other physical facts in Appendix II.

With the large expanse of National Forests and public domain available for recreation pursuits, private recreation opportunities are largely restricted to activities not provided on public lands. In 1968, the county technical action panel conducted an appraisal of development potentials for private outdoor recreation by county (Table 35). Further evaluation of private outdoor recreation opportunities for development was not made.

The opportunities for development of outdoor recreation facilities on National Forests and public domain that could be achieved by 1985 were evaluated. These opportunities are based upon physical adaptability for such development and increased recreation demand described in Appendix II. These include 12 campsites, 2 picnic sites, 1 point of interest, and 1 interpretive site on public domain. These are projected to provide a capacity of 117,000 visitor-days recreation use (Table 36).

COST ANALYSIS

A cost analysis was made of the outdoor recreation facilities identified as development opportunities by 1985 on National Forest and public domain. The installation costs are estimated at $404,000 on National Forests and $159,600 on public domain. Installation costs were amortized for 100 years at 5½ percent interest rate. Replacement, operation, and maintenance costs were added to derive total annual costs. Table 37 shows costs for these outdoor recreation facilities.

ENVIRONMENTAL EVALUATION

The impacts on the environment from the application of these outdoor recreation facilities are not completely known at this time. Resource development and use between now and 1985 will determine to a large extent if quality environment can be maintained that will continue to attract recreation visitors to the area. Hunting and fishing opportunities, scenery, clear air, open space and opportunities to participate in various activities will be essential. Recreation is, therefore, closely linked with how resources are used in the basin.

Effects will generally be adverse. Development will: (1) cause a change in land use, (2) increase noise and dust both during and after construction, (3) reduce wildlife habitat, (4) increase pollution from sewage and solid wastes, (5) create more frequent impacts upon sensitive wildlife, and (6) change the natural scenic landscape.

TABLE 34.--Outdoor recreational facilities, Beaver River Basin

Subbasin	Facility	Existing (1965)	Development potential	Opportunities for development by 1985[a] Total
Fillmore (2A)	Campground & picnic area	7	7	3
	Parks & rest stops	2	0	0
	Points of interest	1	1	0
	Observation & intrepretive sites	0	0	0
	Summer home residences	0	0	0
	Lodges and resorts	1	0	0
	Winter sports	0	0	0
	Water sports	0	1	1
	Public swimming pools	1	0	0
	Golf	0	1	1
Beaver-Milford (2B)	Campground & picnic area	10	8	6
	Parks & rest stops	4	1	0
	Points of interest	1	0	0
	Observation & intrepretive sites	0	3	0
	Summer home residences	3	2	0
	Lodges and resorts	1	2	0
	Winter sports	0	2	0
	Water sports	1	1	1
	Public swimming pools	1	1	0
	Golf	1	1	0
Cedar-Parowan (2B1)	Campground & picnic area	3	16	2
	Parks & rest stops	1	1	1
	Points of interest	2	1	0
	Observation & interpretive sites	4	1	0
	Summer home residences	1	2	0
	Lodges & resorts	2	0	0
	Winter sports	1	0	0
	Water sports	0	0	0
	Public swimming pools	2	0	0
	Golf	1	0	0
Escalante Desert (2B2)	Campground & picnic area	1	4	2
	Parks & rest stops	0	0	0
	Points of interest	1	3	0
	Observation & interpretive sites	0	0	0
	Summer home residences	1	3	0
	Lodges and resorts	0	0	0
	Winter sports	0	0	0
	Water sports	2	0	0
	Public swimming pools	0	0	0
	Golf	0	0	0
Sevier Lake (2)	Campground & picnic area	0	1	1
	Parks and rest stops	0	1	0
	Points of interest	1	2	1
	Observation & interpretive sites	0	1	0
	Summer home residences	0	0	0
	Lodges and resorts	0	0	0
	Winter sports	0	0	0
	Water sports	0	0	0
	Public swimming pools	0	0	0
	Golf	0	0	0
Basin Total	Campground & picnic area	21	36	14
	Parks & rest stops	7	3	1
	Points of interest	6	7	1
	Observation & interpretive sites	4	5	1
	Summer home residences	5	7	0
	Lodges and resorts	4	2	0
	Winter sporta	1	2	0
	Water sports	3	2	2
	Public swimming pools	4	1	0
	Golf	2	2	1

[a]Includes going and accelerated programs.

TABLE 35.--Development potential by county[a] for private outdoor recreation facilities, Beaver River Basin, 1968[b]

Recreation Activity	Development potential				
	Not Evaluated	Zero	Low	Medium	High
Vacation cabins, etc.				BJM	I
Vacation camp sites				BIJM	
Pack trip sites	JM			I	B
Transient camp sites				IJ	B
Picnicking areas	J	B	I		
Cold water fishing			BIJM		
Golf courses	J		IB	M	
Small game & upland game bird hunting			BI	J	M
Big game hunting				BJ	IM
Natural, scenic, and historical areas				BJ	IM
Vacation farms and ranches	I			BJM	
Winter sports areas	J		M	I	B

a Letters represent the following counties: B - Beaver; I - Iron; J - Juab; M - Millard

b Source: Appraisal of potentials for outdoor recreation development by county prepared by county technical action panel, 1968.

TABLE 36.--Summary of opportunities for development of outdoor recreation facilities on National Forests and public domain, Beaver River Basin, 1965-1985

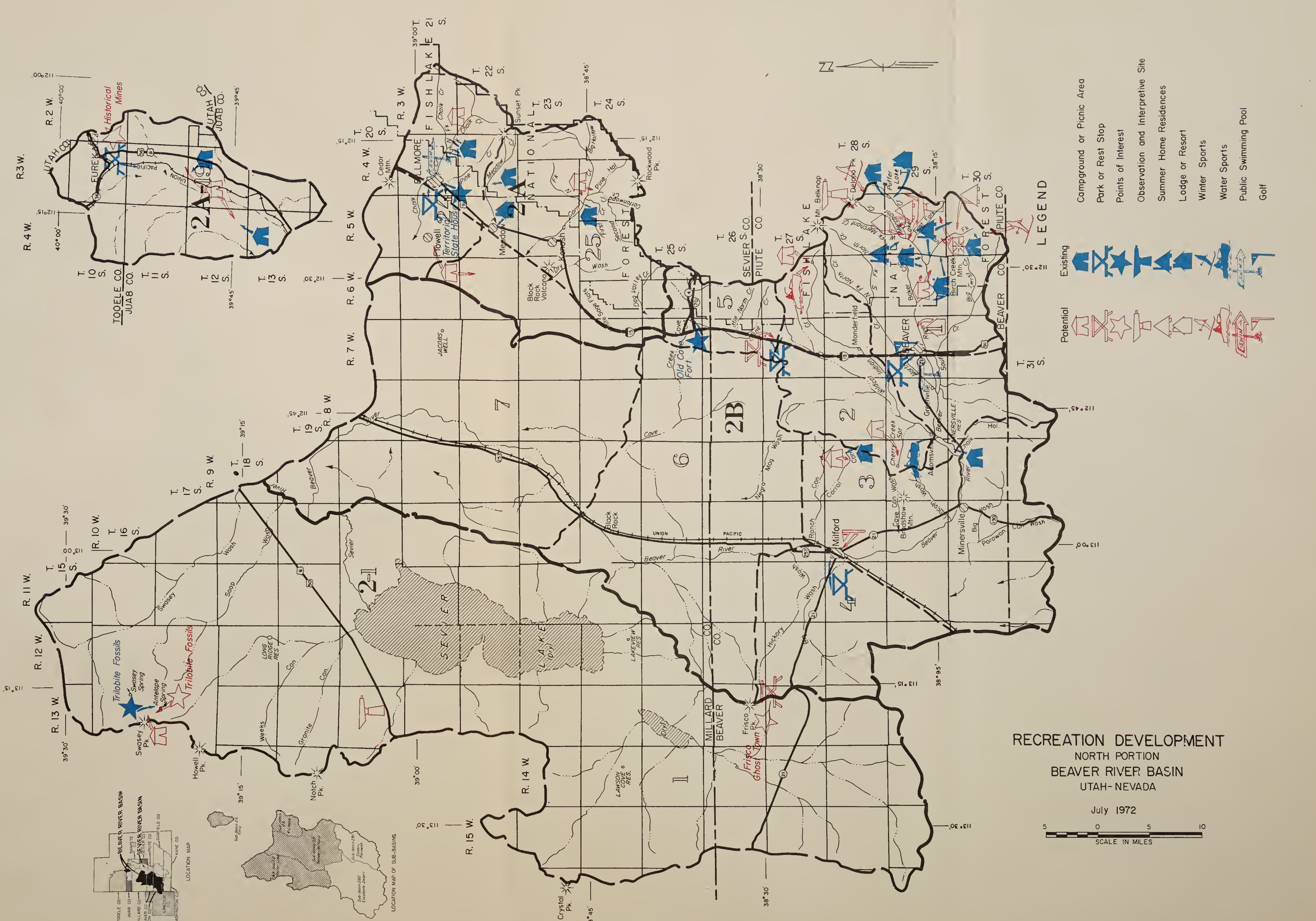
Watershed	Recreation Facility Type	Recreation Facility Name	Administrative responsibility[a]	Projected visitor days annually
Sevier Lake (2-1)	Point of interest	Antelope Springs	BLM	1,000
	Interpretive site	No. Sevier Lake	BLM	1,000
	Campground	Golden Reef	BLM	7,500
Chalk Creek (2A-24)	Campground	Deer Pasture	FS	3,000
	Picnic	Cinders	BLM	2,500
Corn Creek (2A-25)	Campground	Joe Lott	FS	4,000
Beaver (2B-1)	Campgrounds (4)	-	FS	34,000
Minersville (2B-3)	Campground	Rock Corral	BLM	8,000
	Campground	Ranch Canyon	BLM	15,000
Red Creek (2B1-3)	Trailer camp	Bone Hollow	BLM	2,000
Rush Lake (2B1-5)	Picnic	Parowan Gap	BLM	15,000
Pinto Creek (2B2-1)	Trailer camp	Newcastle Reservoir	BLM	10,000
Shoal Creek (2B2-2)	Campground	Enterprise Reservoir	FS	14,000
Total				117,000

a BLM -- Bureau of Land Management, U.S. Department of Interior; FS -- Forest Service, U.S. Department of Agriculture

TABLE 37.--Costs of projected outdoor recreation facilities on National Forests and public domain, Beaver River Basin, 1965-1985

Administrating agency	Visitor days	Installation costs	Annual Costs		
			Amortized[a]	OM&R	Total
		----------	Dollars	----------	
Forest Service	55,000	404,000	22,300	73,800	96,100
BLM	62,000	159,600	8,800	9,000	17,800
Total	117,000	563,600	31,100	82,800	113,900

[a]100 year @ 5½ percent.


RECREATION DEVELOPMENT
NORTH PORTION
BEAVER RIVER BASIN
UTAH-NEVADA
July 1972
SCALE IN MILES
LEGEND
Potential
Existing
Campground or Picnic Area
Park or Rest Stop
Points of Interest
Observation and Interpretive Site
Summer Home Residences
Lodge or Resort
Winter Sports
Water Sports
Public Swimming Pool
Golf
Historical Mines
Trilobite Fossils
Territorial State House
Old Cove Fort
Frisco Ghost Town
SEVIER LAKE (Dry)
FISHLAKE NATIONAL FOREST
MILLARD CO.
BEAVER CO.
SEVIER CO.
PIUTE CO.
TOOELE CO.
JUAB CO.
UTAH CO.
LOCATION MAP
LOCATION MAP OF SUB-BASINS

LEGEND

Potential / Existing

- Campground or Picnic Area
- Park or Rest Stop
- Points of Interest
- Observation and Interpretive Site
- Summer Home Residences
- Lodge or Resort
- Winter Sports
- Water Sports
- Public Swimming Pool
- Golf

LOCATION MAP OF SUB-BASINS

Sub-basin 2A (Meadow Valley Wash)
Sub-basin 2B (Beaver - Minersville)
Sub-basin 2C (Parowan Valley)
Sub-basin 2D (Cedar - Fillmore)
Sub-basin 2E (Fillmore)
Sub-basin 2F (Beaver Lake)

R. 7 W. R. 8 W. R. 9 W. R. 10 W. R. 11 W. R. 12 W. R. 13 W. R. 14 W. R. 15 W. R. 16 W. R. 17 W. R. 18 W. R. 19 W. R. 20 W. R. 71 E. R. 70 E.

T. 29 S. T. 30 S. T. 31 S. T. 32 S. T. 33 S. T. 34 S. T. 35 S. T. 36 S. T. 37 S. T. 38 S. T. 1 S. T. 2 S. T. 3 S.

37° 45' 38° 00' 38° 15' 37° 30' 112° 30' 112° 45' 113° 00' 113° 15' 113° 30' 113° 45' 114° 00'

BEAVER CO. PIUTE CO. IRON CO. GARFIELD CO. WASHINGTON CO. LINCOLN CO. NEVADA UTAH

2B2 2B1 1 2 3 4 5 6

Archeological Site
Petroglyphs
Old Spanish Trail
Jefferson Hunt Historical Site
Old Irontown
Hebron Ghost Town
Hamblin Ghost Town
Pioneer Industrial

Modena, Beryl, Beryl Junction, Newcastle, Enterprise, Pinto, Iron Mtn., Stoddard Mtn., Table Bu., The Three Pks., Flat Top Mtn., Big Mtn., Horrison Pk., Hamilton Fort, Lone Tree Mtn., Ashdown Cr., Summit, Parowan, Paragonah, Cottonwood Mtn., Little Creek Pk., Red Creek Res., Hoosier L.O., Little Salt L. (Intermittent), Quichapa (Unintermittent), Lower Enterprise Res., Enterprise Res., Newcastle Res., Cedar Breaks Natl. Mon., Dixie National Forest, Fishlake National Forest

RECREATION DEVELOPMENT
SOUTH PORTION
BEAVER RIVER BASIN
UTAH - NEVADA

July 1972

5 0 5 10
SCALE IN MILES